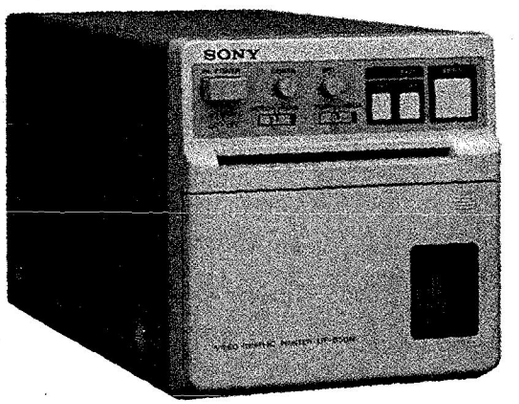
UP-850N

SERVICE MANUAL

US Model
Canadian Model



SPECIFICATIONS

Thermal head	Thin-film thermal head (with built-in drive IC) 768-dot drive		
Gradations	128 (black and white)		
Print size (at aspect ratio 3:4)			
		EIA	CCIR
	NORM:	70 × 91 mm ($2^{3}/_{4} \times 3^{37}/_{64}$ inches) (h/w)	70 × 91 mm ($2^{3}/_{4} \times 3^{37}/_{64}$ inches) (h/w)
	WIDE 1:	73 × 96 mm ($2^{7}/_{8} \times 3^{25}/_{32}$ inches) (h/w)	73 × 96 mm ($2^{7}/_{8} \times 3^{25}/_{32}$ inches) (h/w)
	WIDE 2:	75 × 100 mm ($2^{61}/_{64} \times 3^{15}/_{16}$ inches) (h/w)	75 × 100 mm ($2^{61}/_{64} \times 3^{15}/_{16}$ inches) (h/w)
Effective pixels		EIA	CCIR
	NORM:	472 lines × 700 dots (h/w)	560 lines × 700 dots (h/w)
	WIDE 1:	490 lines × 736 dots (h/w)	582 lines × 736 dots (h/w)
	WIDE 2:	508 lines × 768 dots (h/w)	608 lines × 768 dots (h/w)
Printing speed	Approx. 9 seconds/screen (at aspect ratio 3:4)		

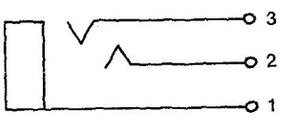
Input/Output terminals

VIDEO IN (BNC)
- EIA or CCIR
- Composite Video Signals
  - 1.0 Vp-p
  - 75 ohms/high-impedance

MONITOR OUT (BNC)
- EIA or CCIR
- Composite Video Signals
  - 1.0 Vp-p, 75 ohms
  - Loop-through/ D/A Output
  - Changeover Switch Method

REMOTE (stereo minijack) *
- Connect optional
- Foot switch FS-20

*Technical Specifications



1. GND
2. PRINT SIGNAL (TTL)
   Input of LOW pulse over 100 msec. initiate print.
3. PRINT BUSY (TTL)
   Goes HIGH during printing

Power requirements	100–120 V AC, 50/60 Hz
Power consumption	60 W (IRE 50) 10 W (standby) 1.5 A
Dimension	154 × 165 × 322 mm (incl. projecting parts) ($6^{1}/_{16} \times 6^{1}/_{2} \times 12^{43}/_{64}$ inches) (w/h/d)
Weight	3.9 kg (main unit only) (8 lb 10 oz)
Accessories supplied	AC power cord (1) Paper roll (UPP-110HD) (1) Head cleaning sheet (1) Connecting cable (BNC-BNC) (1)

Design and specifications subject to change without notice.

VIDEO GRAPHIC PRINTER

SONY®

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SAFETY-RELATED COMPONENT WARNING !!

COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY. CIRCUIT ADJUSTMENTS THAT ARE CRITICAL TO SAFE OPERATION ARE IDENTIFIED IN THIS MANUAL. FOLLOW THESE PROCEDURES WHENEVER CRITICAL COMPONENTS ARE REPLACED OR IMPROPER OPERATION IS SUSPECTED.

ATTENTION AUX COMPOSANTS RELATIFS À LA SÉCURITÉ!!

LES COMPOSANTS IDENTIFIÈS PAR UNE TRAME ET PAR UNE MARQUE ⚠ SUR LES SCHÉMAS DE PRINCIPE, LES VUES EXPLOSÉES ET LES LISTES DE PIECES SONT D'UNE IMPORTANCE CRITIQUE POUR LA SÉCURITÉ DU FONCTIONNEMENT. NE LES REMPLACER QUE PAR DES COMPOSANTS SONY DONT LE NUMÉRO DE PIÉCE EST INDIQUÉ DANS LE PRÉSENT MANUEL OU DANS DES SUPPLÉMENTS PUBLIÉS PAR SONY. LES RÉGLAGES DE CIRCUIT DONT L'IMPORTANCE EST CRITIQUE POUR LA SÉCURITÉ DU FONCTIONNEMENT SONT IDENTIFIES DANS LE PRÉSENT MANUEL. SUIVRE CES PROCÉDURES LORS DE CHAQUE REMPLACEMENT DE COMPOSANTS CRITIQUES, OU LORSQU'UN MAUVAIS FONCTIONNEMENT EST SUSPECTÉ.

SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are '"pinched" or contact high-wattage resistors.
3. Check that all control knobs, shields, covers, ground straps, and mounting hardware have been replaced. Be absolutely certain that you have replaced all the insulators.
4. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Point them out to the customer and recommend their replacement.
5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
6. Check the line cord for cracks and abrasion. Recommend the replacement of any such line cord to the customer.
7. Check the condition of the monopole antenna (if any).
   Make sure the end is not broken off, and has the plastic cap on it. Point out the danger of impalement on a broken antenna to the customer, and recommend the antenna's replacement.
8. Check the B+ and HV to see they are at the values specified. Make sure your instruments are accurate; be suspicious of your HV meter if sets always have low HV.
9. Check the antenna terminals, metal trim, "metallized" knobs, screws, and all other exposed metal parts for AC leakage. Check leakage as described below.

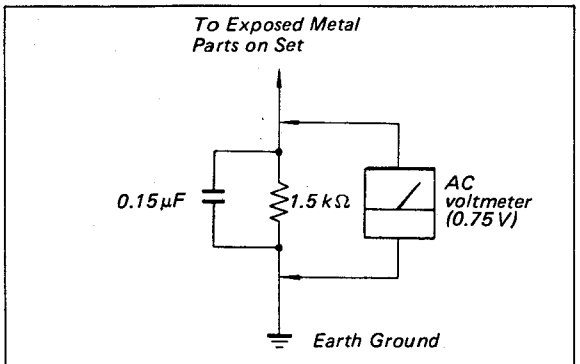


Fig. A. Using an AC voltmeter to check AC leakage.

LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA (500 microampers). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers' instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The "limit" indication is 0.75 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. Nearly all battery operated digital multimeters that have a 2 V AC range are suitable. (See Fig. A)

HOW TO FIND A GOOD EARTH GROUND

A cold-water pipe is guaranteed earth ground; the cover-plate retaining screw on most AC outlet boxes is also at earth ground. If the retaining screw is to be used as your earth-ground, verify that it is at ground by measuring the resistance between it and a cold-water pipe with an ohmmeter. The reading should be zero ohms. If a cold-water pipe is not accessible, connect a 60–100 watts trouble light (not a neon lamp) between the hot side of the receptacle and the retaining screw. Try both slots, if necessary, to locate the hot side of the line, the lamp should light at normal brilliance if the screw is at ground potential. (See Fig. B)

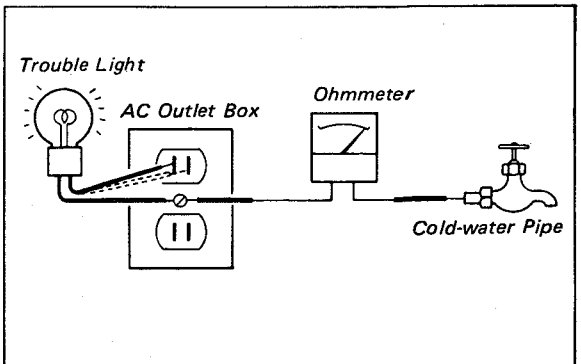


Fig. B. Checking for earth ground.

SECTION 1
GENERAL

1-1. OVERVIEW

The UP-850N is a black-and-white video graphic printer. You can use it to make print-outs of the monitor screen quickly and easily. It has the following features:

- The new thin-thermal head with a built-in high-speed drive IC allows high definition printing (7.7 dots/mm).
- 128 gradations of black and white.
- High density printing is possible with TYPE II printing paper.
- Temperature compensation circuit prevents uneven printing density caused by changes in temperature.
- Fast printing of approximately 9 seconds (at scanning width—WIDE1, aspect ratio 3:4).
- Range to be printed out can be changed (NORM, WIDE1, WIDE2).
- Automatic video signal discriminator selects the video signal type (EIA or CCIR) as it is input; there is no need to change any switch manually.
- NORM/REV switch allows the print-out to be made bottom end first or upper part of the screen first.
- Aspect ratio can be changed from 3:4 to 1:1.
- The original video signal and that adjusted by the various controls of the printer can be monitored on the screen.
- Approximately 210 print-outs with the supplied roll of printing paper (at aspect ratio 3:4).

1-2. PRECAUTIONS

On safety

Operate the unit on 100 to 120 V AC, 50/60 Hz.

Stop operation immediately if any liquid or solid object should fall into the cabinet. Unplug the unit and have it checked by a qualified personnel.

Unplug the unit from the wall outlet if you do not use if for a long time. Disconnect the cord by grasping the plug. Never pull the cord itself.

Do not disassemble the cabinet. Refer servicing to qualified personnel only.

Do not touch the cutting blade of the printer.

On installation

Provide adequate air circulation to prevent heat build-up. Do not place the unit on surfaces (rugs, blankets, etc.) or near materials (curtains, draperies).

Place the printer on a level, stable surface during operation.

Do not install the printer near heat sources. Avoid locations near radiators or air ducts, places subject to direct sunlight or excessive dust, humidity, mechanical shock or vibration.

On the printing paper

Type of printing paper

Use only the specified UPP-110 series printing paper. Use of other printing paper may cause malfunction.

Before making a print-out, set the PAPER switch of the DIP switches according to the type of paper used.

PAPER switch (image density)	Type of paper
TYPE I (Normal) TYPE II (High Density)	UPP-110S, 110 UPP-110HD

Inserting the paper roll

Do not fold the paper nor rub or touch the printing surface. Dust on the printing surface will also result in poor printing quality.

When loading the supplied UPP-110HD paper roll, pull out and tear off the first 15 to 20 cm (6 inches to 8 inches) of the paper.
Otherwise the printing quality will not be satisfactory and the printer may malfunction.

Storage

Do not leave unused or printed paper in hot or humid places. Do not leave for an extended period of time in a place subject to direct sunlight or bright room light.

Store unused or printed paper in a cool, dark place (below 30°C). We recommend that you store printed paper in a polypropylene pouch.

Do not allow any volatile organic solvent or vinyl chloride to contact the printed paper. Alcohol, plastic tape or film will fade the print-out. To fix printed paper onto another piece of paper, use double-sided plastic tape or water-based or solid glue.

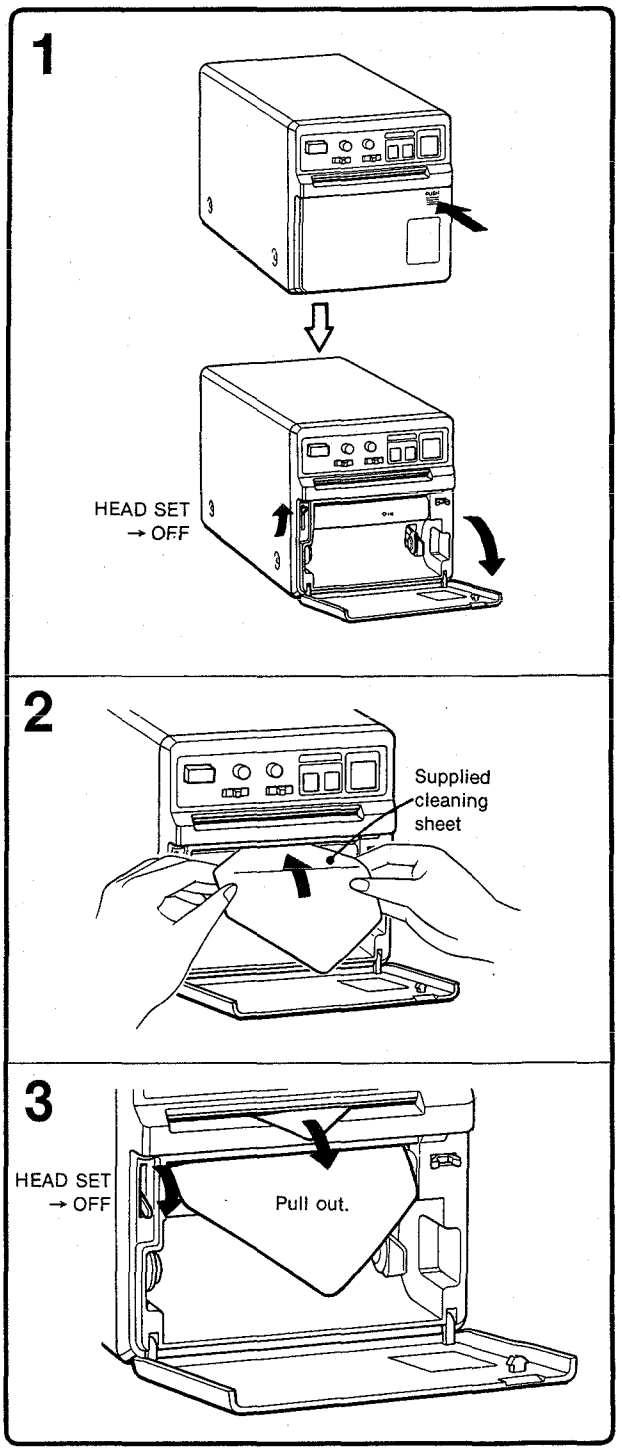
Do not stack printed paper on or under a freshly-developed diazo copy sheet.

On maintenance

Do not use any type of solvent, like alcohol or benzine, *which may damage the finish.*
Clean the cabinet, panel and controls with a dry soft cloth, or a soft cloth lightly moistened with a mild detergent solution.

Use the supplied cleaning sheet to clean the printing head, when the print-out is dirty.

How to use the supplied cleaning sheet

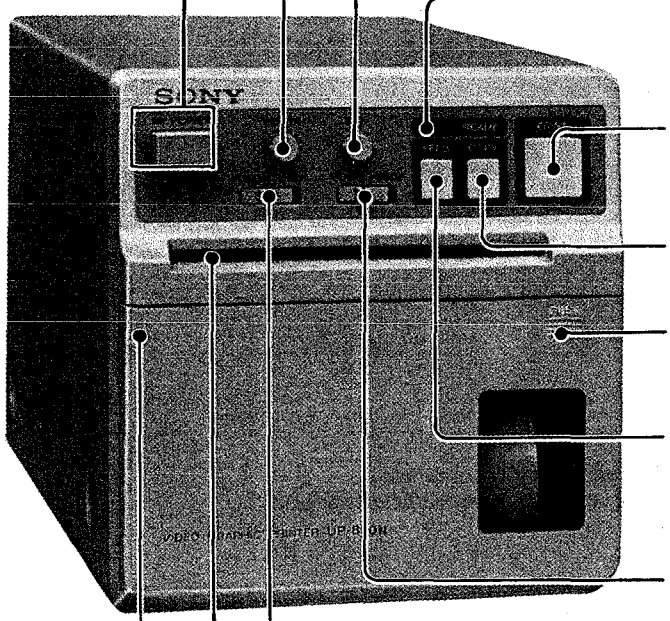


If you have any questions or problems concerning your unit, please contact your nearest Sony service facility.

1-3. LOCATION AND FUNCTION OF PARTS AND CONTROLS

Refer to the pages indicated in the circles for details.

Front panel



POWER switch and indicator
Indicator lights when the power is on.

CONTR (contrast) control ⓯
Adjusts the contrast of the print-outs.

BRT (brightness) control ⓯
Adjusts the brightness of the print-outs.

READY indicator ⓯
Lights when the printer is ready to produce print-outs.

PRINT button ⓯
Prints the screen displayed at that instant.

COPY button ⓯
Copies the previous print-out.

PUSH
Opens the lid.

FEED (paper feed) button ⓯
Feeds paper out while the button is pressed.

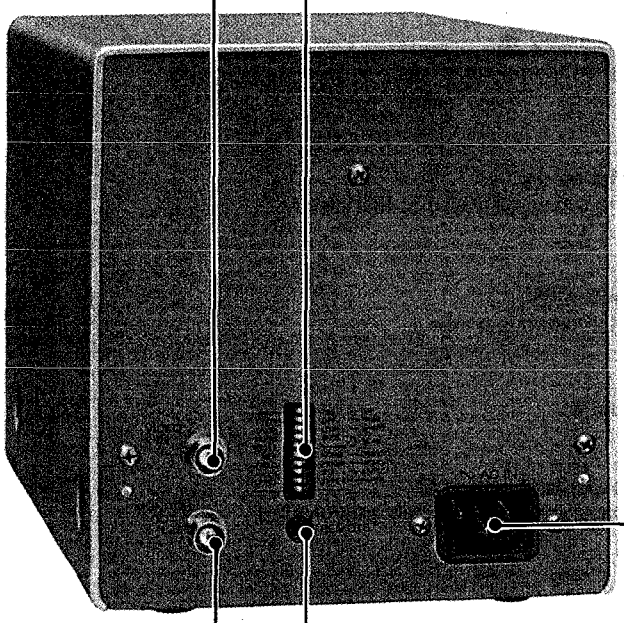
POSI/NEGA selector ⓯
Allows you to select whether to make positive or negative (reverse) print-outs.

MONITOR OUT selector ⓯
Allows you to compare on the monitor, either the signal straight from video equipment (VIDEO) or the signal adjusted by the printer for print-out (D/A)

Cutting blade

HEAD SET lever ⓭
Sets the thermal head to be ready for printing.

Rear panel



VIDEO IN (video input) connector (BNC)
For connecting a video source to be printed out.

DIP switches
Sets a variety of functions. See page 9.

AC IN connector (AC power inlet)
For connecting the supplied AC power cord.

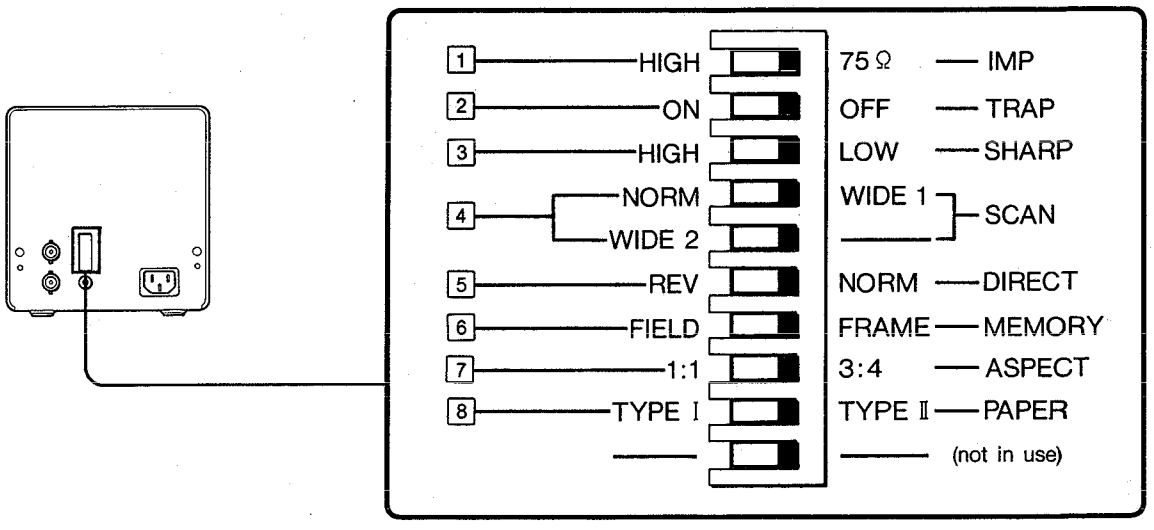
REMOTE control jack (stereo minijack)
Allows the optional foot switch FS-20 or remote commander RM-81 to be connected for controlling printing from a distance.

MONITOR OUT (monitor output) connector (BNC)
Allows a color/monochrome monitor to be connected. Either video signal straight from video equipment or video signal adjusted by the printer can be monitored.

1-4. SETTING OF THE DIP SWITCHES

Set the DIP switches according to the function required and the type of equipment connected.
Before setting the DIP switches, turn the printer off. Then change the setting with a small pointed tool such as a screwdriver.

The figure shows the default setting of the DIP switches.



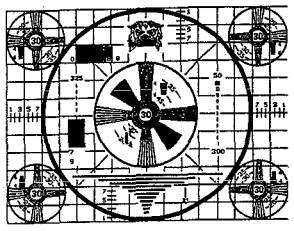
1 IMP (impedance) switch
Set this switch to 75 ohms when the video output connector of your video equipment is directly and exclusively connected to the VIDEO IN connector. Set to HIGH when the video cable connected to the printer has other equipment (such as a monitor) connected to it.

2 TRAP (color) switch
Set this switch to ON when signals to be printed out are in color and to OFF when it is in black and white.

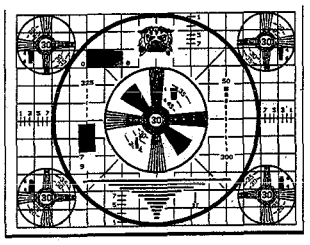
3 SHARP (sharpness) switch
Set this switch to HIGH to obtain greater sharpness of the print-out.

4 SCAN switch

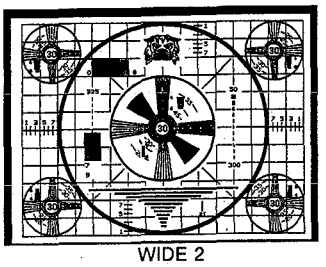
Extends the range to be printed out.
To print only the part of the screen displayed on the monitor, set to NORM. To extend the range, set the switch to WIDE 1 (be sure that the other switch is not set to WIDE 2). To further extend the range, set the switch to WIDE 2. WIDE 2 will be selected, regardless of the position of the NORM-WIDE 1 switch.



NORM



WIDE 1



WIDE 2

5 DIRECT switch

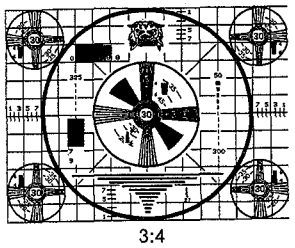
Selects which end of the screen is to be printed out first. Normally, keep this switch at NORM. The screen will be printed out bottom end first. To print out the upper part of the screen first, set it to REV.

6 MEMORY switch

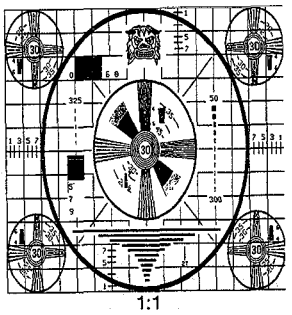
Normally, keep this switch at FRAME. When printing out fast moving pictures (such as movement of a ball being thrown), the print-out may blur. In this case, set the switch to FIELD. The print-out will be slightly rough but less blurred.

7 ASPECT switch

Normally keep this switch at 3:4. When the aspect ratio of the video signal is 1:1, set this switch to 1:1. The print-out will be longer than the print-out taken at 3:4.



3:4



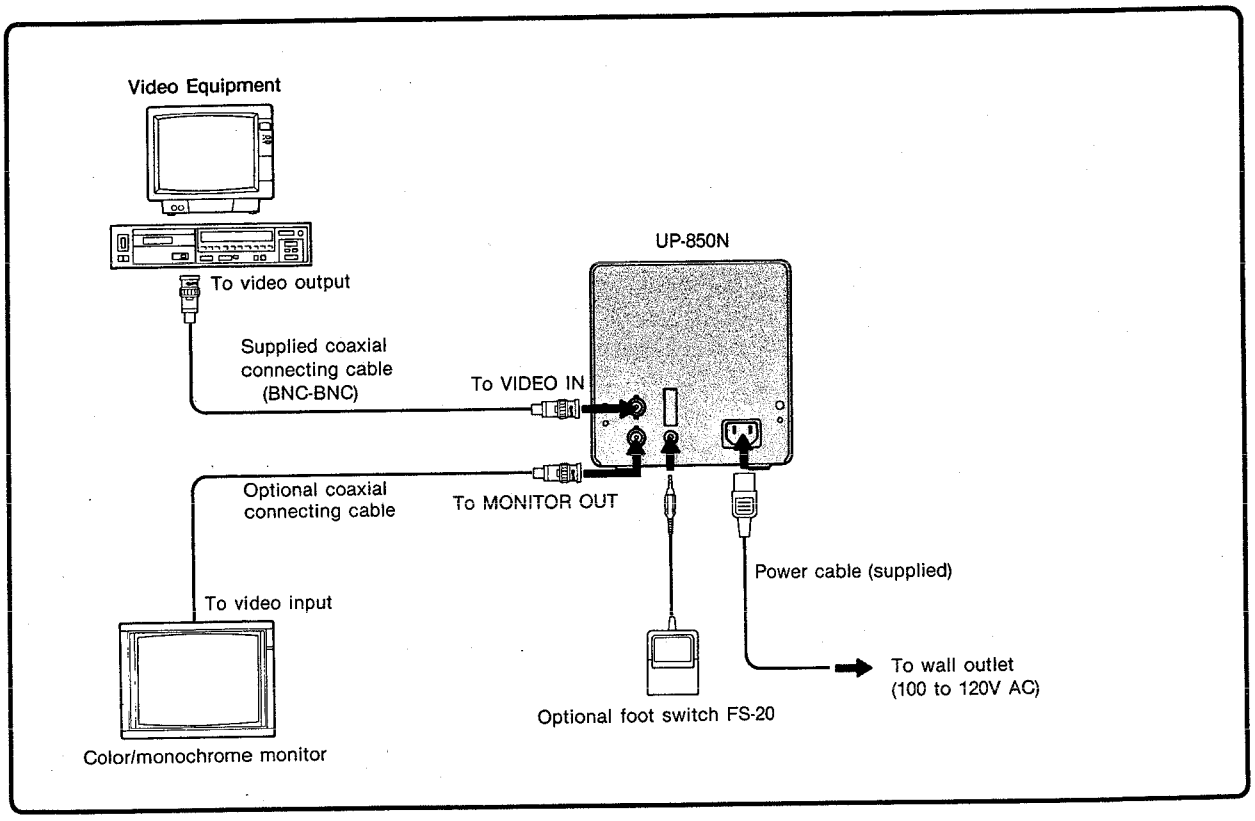
1:1

8 PAPER switch

Set to TYPE II when using the supplied UPP-110HD paper roll. Set to TYPE I when using the Sony UPP-110S, UPP-110 paper roll. See page 5.

1-5. CONNECTION

- Turn off the power of each unit before making connections.
- Connect the AC power cord last.

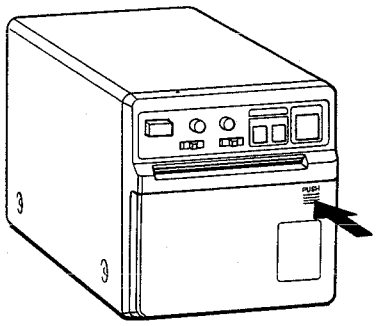


1-6. PAPER LOADING

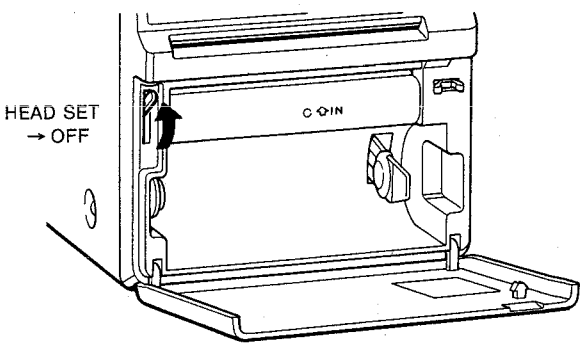
Notes

- Use only the Sony UPP-110HD, 110S or 110 paper roll.
- Be sure to set the PAPER switch of the DIP switches according to the type of paper you use. See page 5.
- When loading the supplied UPP-110HD paper roll, the first 15 to 20 cm (6 to 8 inches) must be pulled out and torn off before actual printing can be made.

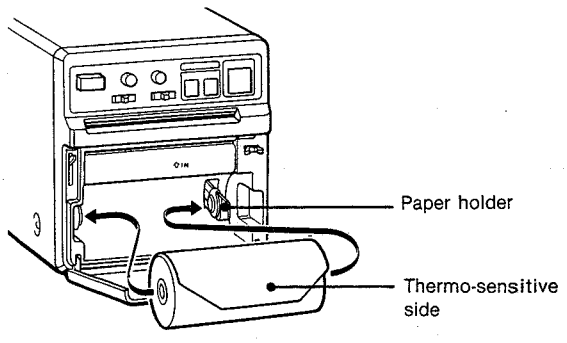
1 Press PUSH and open the lid.



2 Lift the HEAD SET lever to OFF.



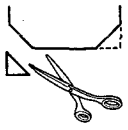
3 Push in paper holder to insert the roll.

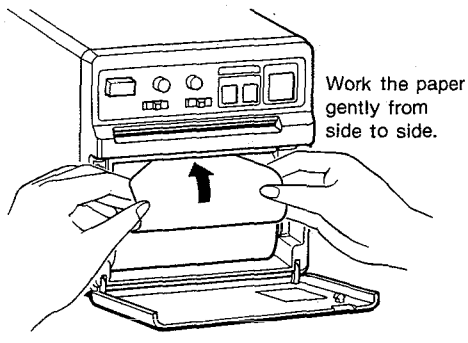


Load the paper with the thermo-sensitive side up.
Printing is impossible if it is loaded the other way.

4 Insert the paper end into the slot.

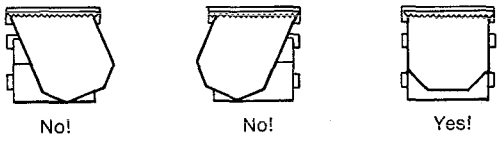
When the remainders of the paper roll become small, cut the edge of the paper as below for smooth loading.

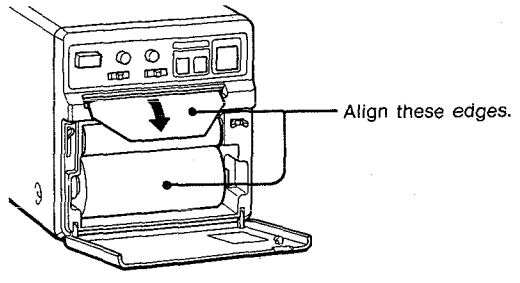




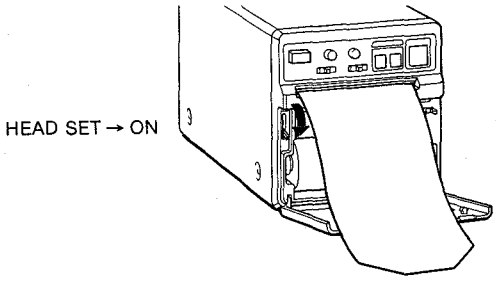
5 Slightly pull out the paper and align its edges.

When loading the supplied UPP-110HD paper roll, pull out 15 to 20 cm (6 to 8 inches) of the printing paper.

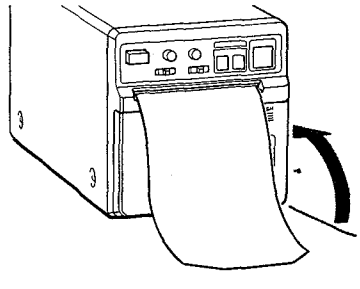




6 Set the HEAD SET lever to ON.

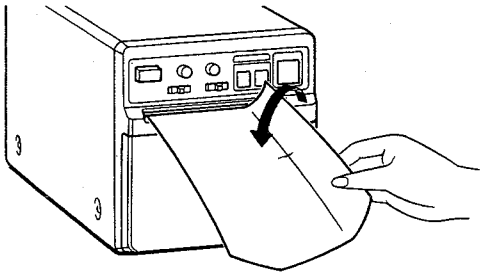


7 Close the lid.



8 When loading the supplied UPP-110HD paper roll:

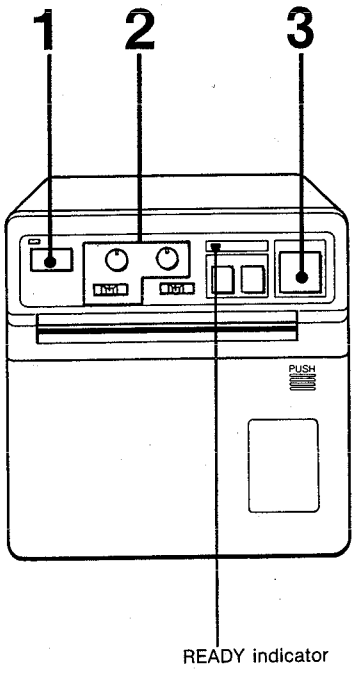
Pull out and tear the first 15 to 20 cm (6 to 8 inches) of the printing paper.



When the printer is not to be used for a while
If the printer will not be used for more than 2 weeks, lift the HEAD SET lever to the OFF position. Otherwise, the thermal head may adhere to the platen, causing damage to the platen and uneven printing.

1-7. OPERATION

Before operation:
- Be sure that the setting of the DIP switches are correct. (see page 9).
- Be sure that the connections are correct and that the print source is input to the printer.

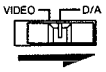


1 Press the POWER switch.

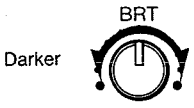
The POWER and READY indicator light up.

2 Set the monitor OUT selector to D/A.

While viewing the picture on the monitor, adjust the picture you want to print-out.



To adjust the brightness of the print-out, use the BRT control.



To adjust the contrast of the print-out, use the CONTR control.

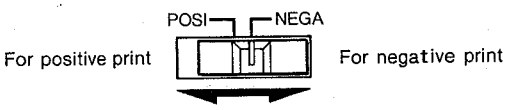
3 Press the PRINT button when the screen shows the picture you want to print.

To stop printing
Press FEED. Printing will stop and paper will continue to feed while FEED is pressed.

To stop printing and print another picture shown on the screen
Press PRINT. Printing will stop and the picture shown on the screen will be print out.

To copy the previous print-out again
Press COPY. The last print-out will be copied. This last print-out is retained in the memory of the printer and can be copied with the COPY button as many times as you want, until PRINT is pressed again or power is turned off and the memory is erased.
The COPY button will not function while a print-out is being made.

To reverse black and white of the print-out
Use the POSI/NEGA selector.

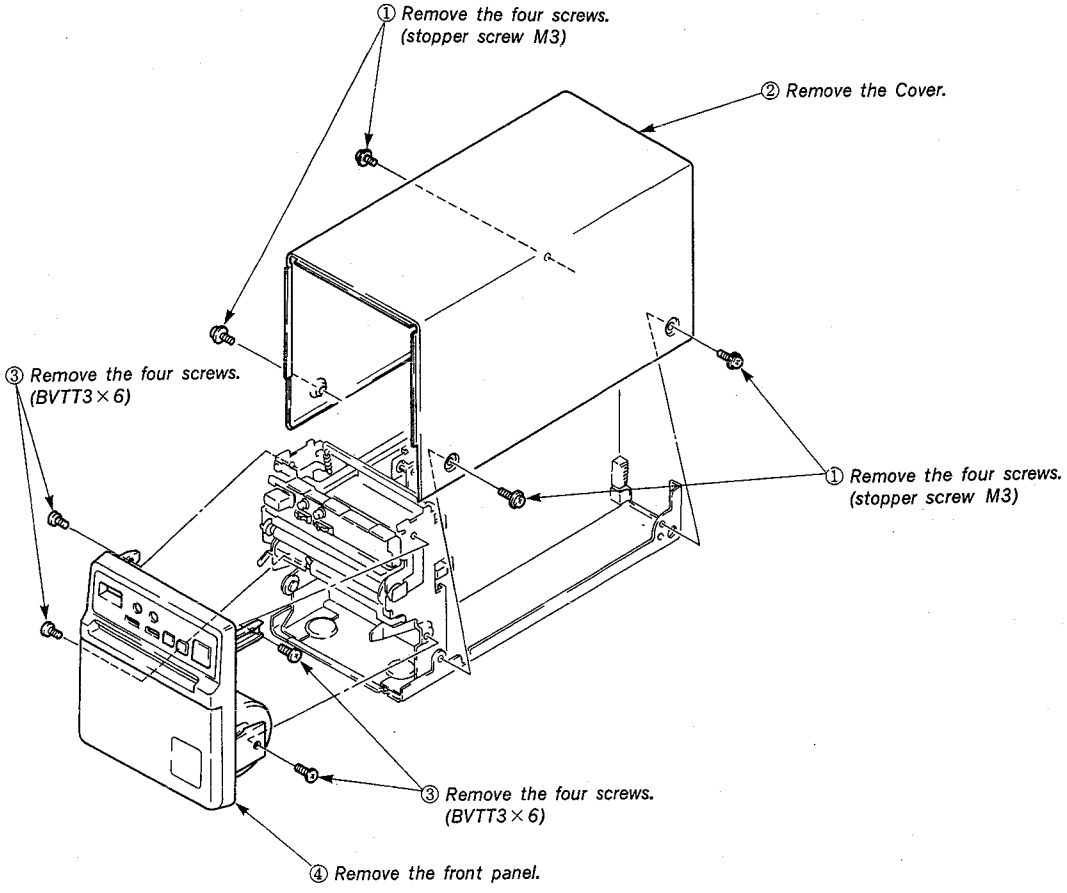


1-8. TROUBLESHOOTING

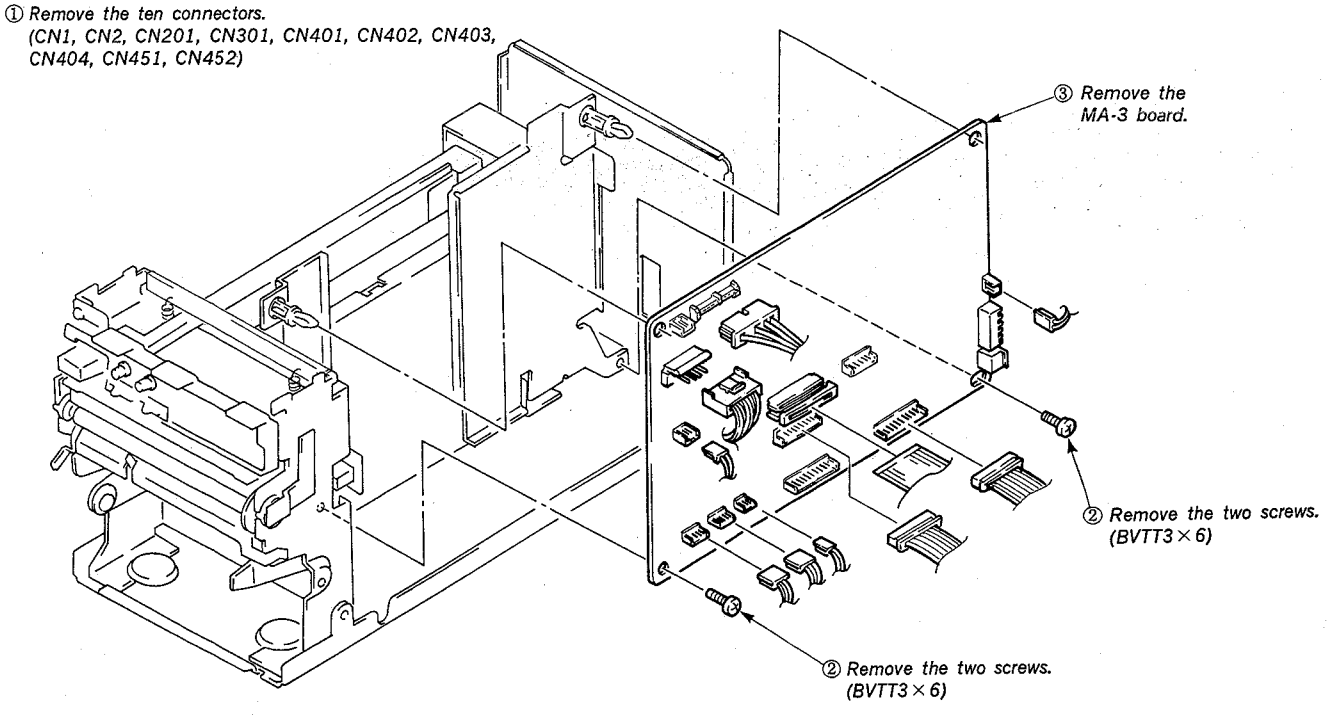
Symptom	Corrective actions
Fine dust appears on the first few print-outs.	Have you just replaced the paper roll? When printing with a newly-inserted roll, fine dust on the surface of the paper may appear on the first few print-outs. Press the FEED button until completely clean paper comes out.
Printing does not start when PRINT button is pressed.	• If the paper does not feed. —Is the power turned on? —Are the connections correct? —Is the print source being input to the printer? • If the paper feeds but print-out is not made. —Is the paper roll inserted correctly with the thermo-sensitive face upward? —Has the first 15 to 20 cm (6 to 8 inches) of the paper roll been torn off when using the supplied UPP-110HD paper roll?
READY indicator has gone off.	—Is the power turned on? —Insert a new paper roll. —Set the HEAD SET lever to ON.
A black border appears around the print-out. Or the borders are not printed.	Change the setting of the SCAN switch of the DIP switches (see page 10).
The paper is jammed.	Set the HEAD SET lever to OFF and take out the paper roll. Then carefully remove the stuck paper by hand. Do not use pointed devices such as screwdrivers as they may damage the surface of the platen or the thermal head. In case of moisture condensation, leave for 1 – 2 hours to dry out, or gradually raise the temperature of the room until moisture is evaporated. Then press the FEED button while pulling gently on the end of the paper to ensure that it is fed through smoothly.
Print-out is dirty.	The head is dirty. —Firmly insert the supplied head cleaning sheet and pull its edge with the HEAD SET lever set to ON (see page 6).
After having printed out almost totally black pictures, white portions of subsequent prints turned black	When the printer continually prints 15 or more totally black pictures, the white portions of the subsequent pictures may turn black (at 20°C, with the supplied UPP-110HD printing paper). —Stop printing for a while.
After having printed out almost totally black pictures, the subsequent prints became faint.	When the printer continually prints 15 or more totally black pictures, the subsequent prints may become faint. —This is caused by a protective circuit which prevents the thermal head from overheating. Stop printing for a while. Printing will resume when the temperature of the printing head drops to normal.
White lines and small letters on the screen are obscure.	Is the TRAP switch of the DIP switches set to ON when the input signal is in black and white?
Small squares appear on the whole screen.	Is the TRAP switch of the DIP switches set to OFF when the input signal is in color?
The print-out is too dark or too light to adjust.	Is the IMP switch of the DIP switches set correctly?
The print-out seems vertically long.	The ASPECT switch of the DIP switches may be set to 1:1. —Set to 3:4

SECTION 2
DISASSEMBLY AND REPLACEMENT

2-1. FRONT PANEL REMOVAL

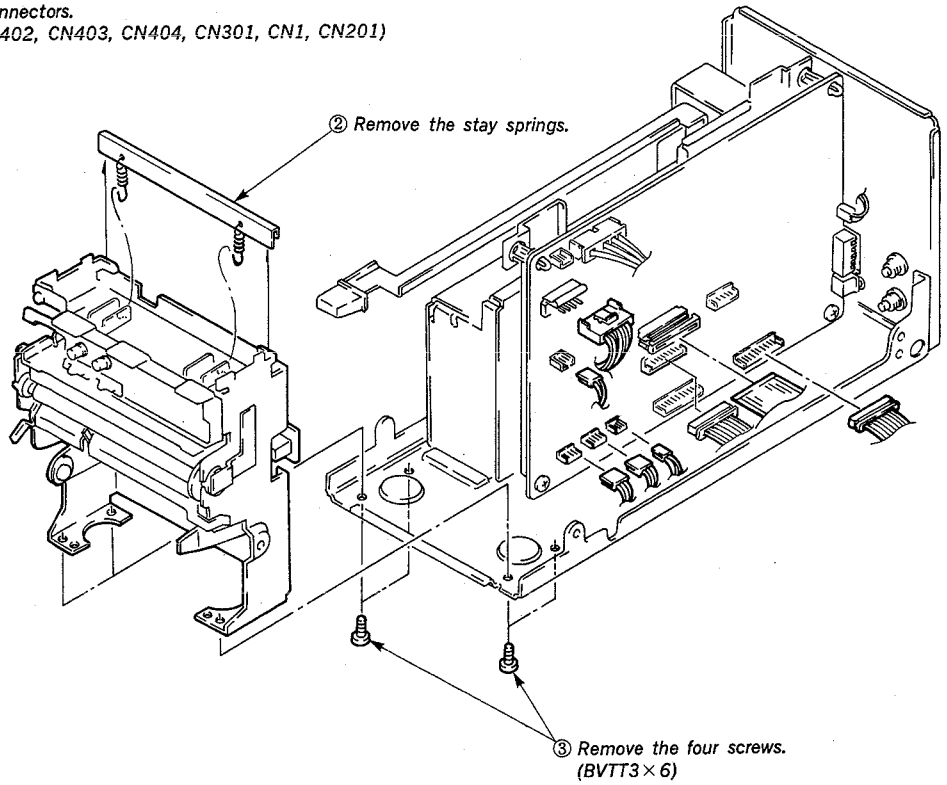


2-2. MA-3 BOARD REMOVAL



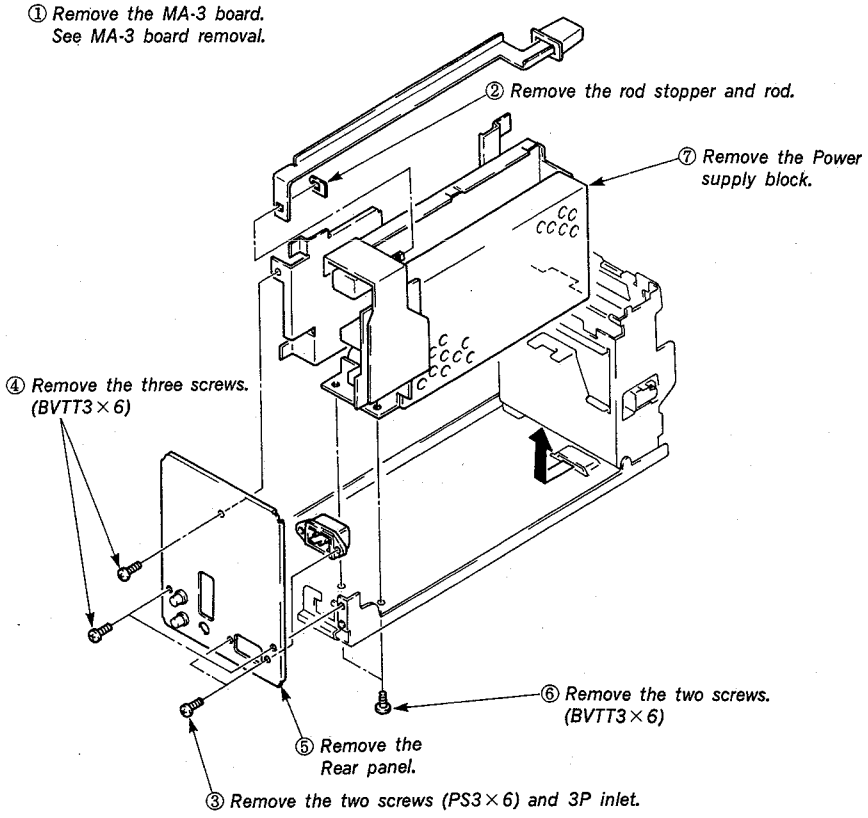
2-3. PRINT MECHANISM REMOVAL

① *Remove the eight connectors.*
(CN452, CN401, CN402, CN403, CN404, CN301, CN1, CN201)

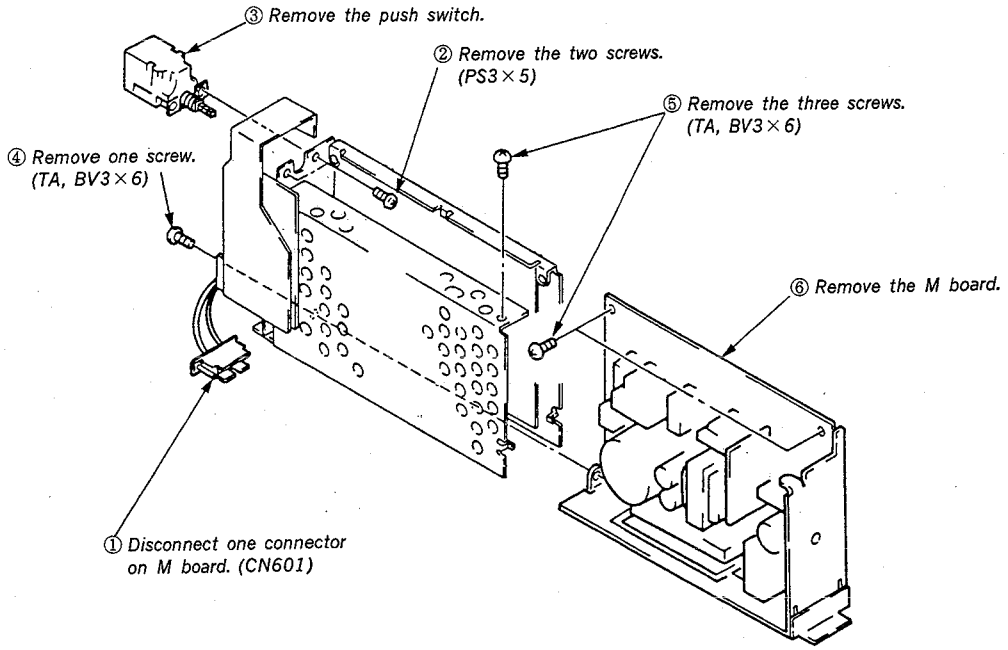


2-4. POWER SUPPLY BLOCK REMOVAL

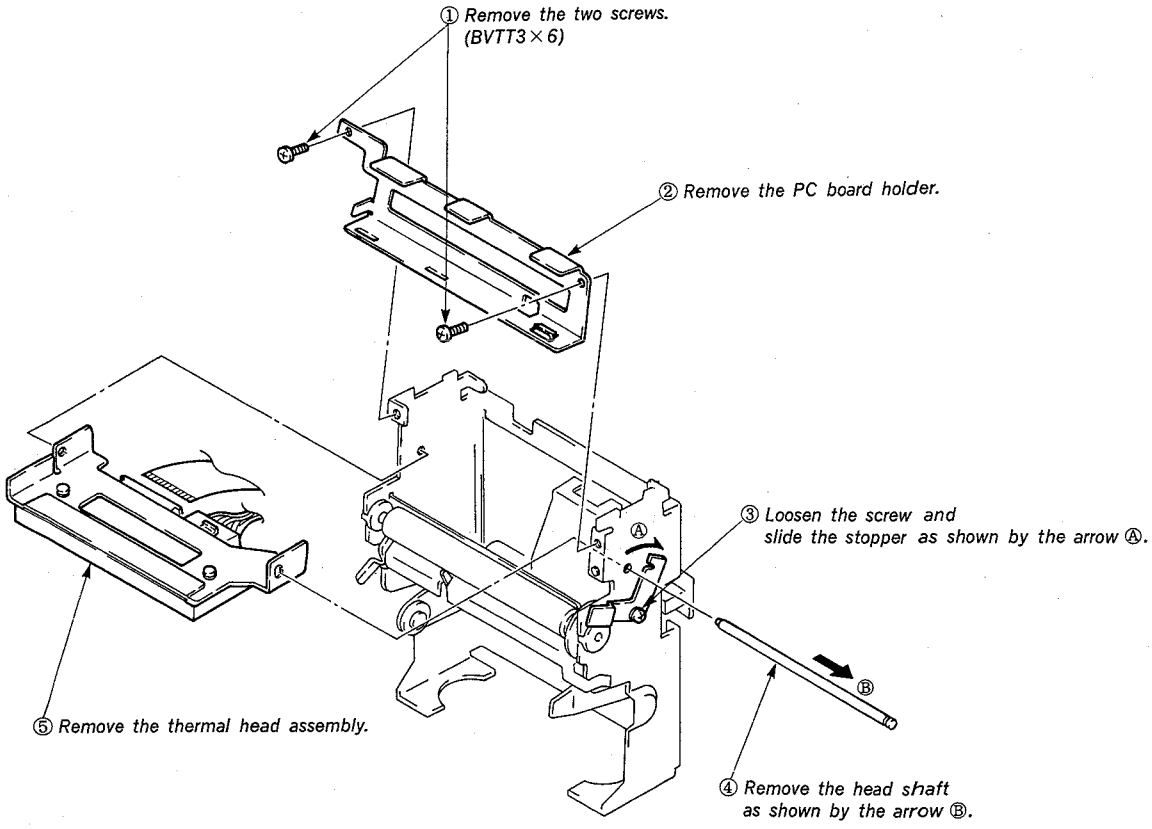
① *Remove the MA-3 board.*
See MA-3 board removal.


② Remove the rod stopper and rod.
⑦ Remove the Power supply block.
④ Remove the three screws.
(BVTT3×6)
⑥ Remove the two screws.
(BVTT3×6)
⑤ Remove the Rear panel.
③ Remove the two screws (PS3×6) and 3P inlet.

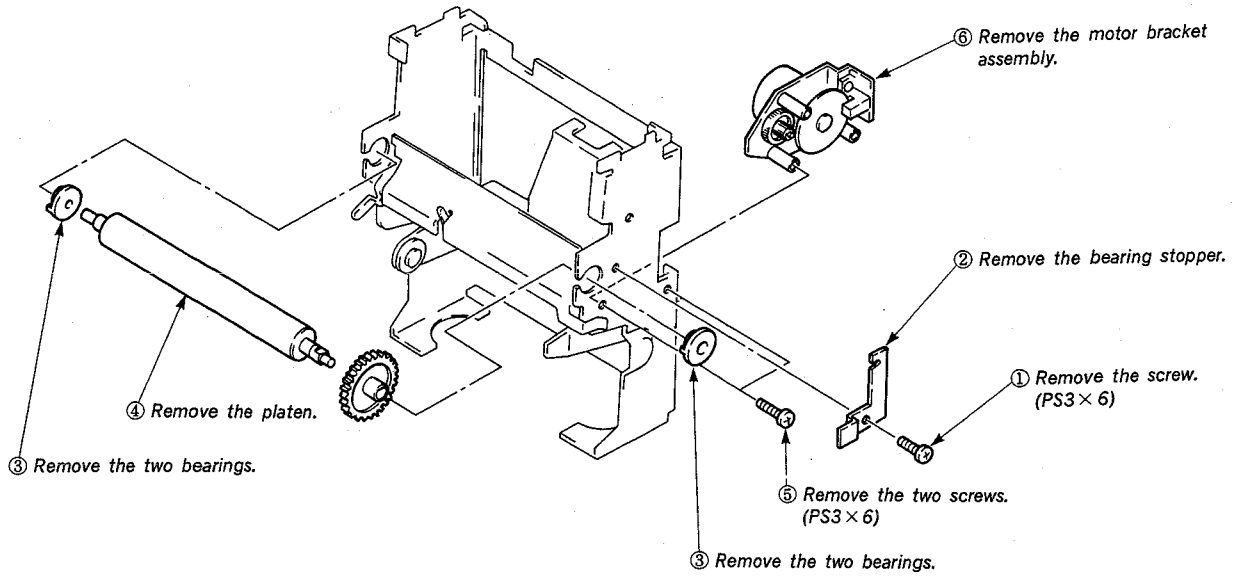
2-5. M BOARD REMOVAL


③ Remove the push switch.
② Remove the two screws. (PS3×5)
⑤ Remove the three screws. (TA, BV3×6)
④ Remove one screw. (TA, BV3×6)
⑥ Remove the M board.
① Disconnect one connector on M board. (CN601)

2-6. THERMAL HEAD ASSEMBLY REMOVAL


① Remove the two screws. (BVTT3×6)
② Remove the PC board holder.
③ Loosen the screw and slide the stopper as shown by the arrow Ⓐ.
⑤ Remove the thermal head assembly.
④ Remove the head shaft as shown by the arrow Ⓑ.

2-7. PLATEN MOTOR BRACKET ASSEMBLY REMOVAL

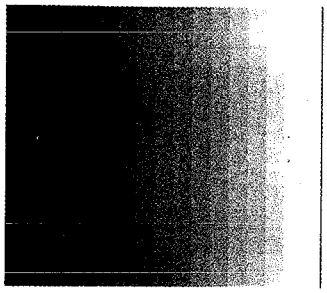
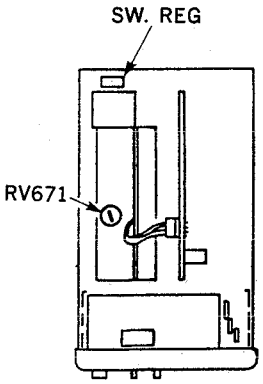

⑥ Remove the motor bracket assembly.
② Remove the bearing stopper.
① Remove the screw. (PS3 × 6)
④ Remove the platen.
③ Remove the two bearings.
⑤ Remove the two screws. (PS3 × 6)
③ Remove the two bearings.

SECTION 3
ADJUSTMENTS

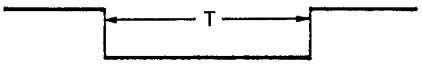
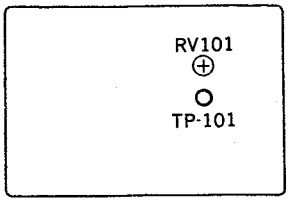
Note : Equipment Required

1. Osilloscope
2. Frequency counter
3. Color-bar pattern generator (1410. Signal generator)
4. Signal generator (J-9000-010-A)
5. Digital multimeter

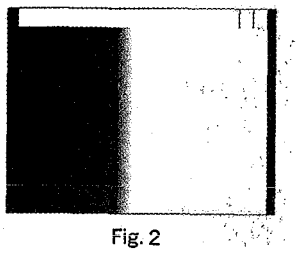
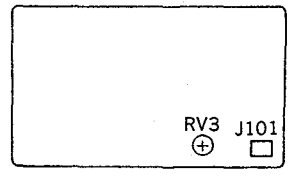
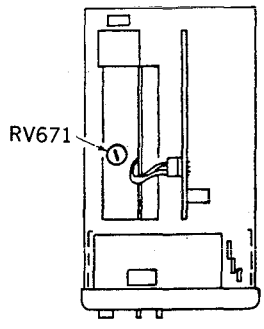
3-1. HEAD VOLTAGE ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: Color-bar • Set the POWER switch to ON while pressing the buttons of [PRINT], [COPY] and [FEED] at the same time. Note: Do not release the above button until READY lamp lights. • For printing out, press [PRINT] button.	 Fig. 1 Adjust RV671 to make smooth 17-steps gradation signal as shown in Fig. 1.	◐RV671 

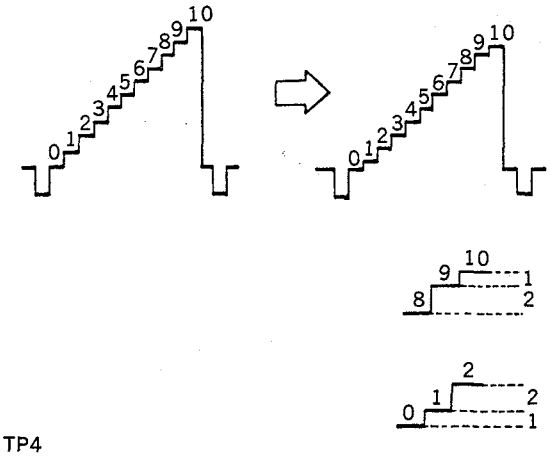
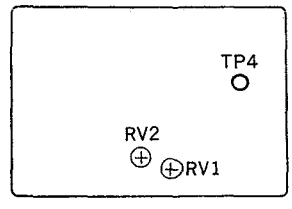
3-2. V. DELAY ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: Color-bar • Set the knobs of [CONTR] and [BRT] to the center position.	TP101  T=382±5μsec	◐RV101/C-3(MA-3) 

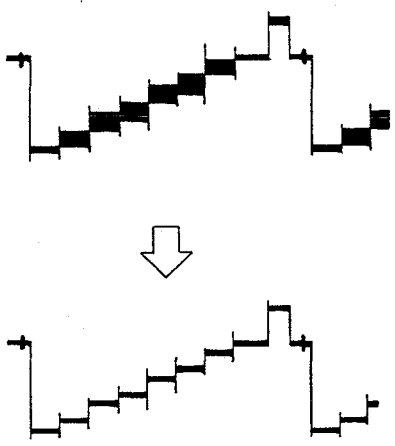
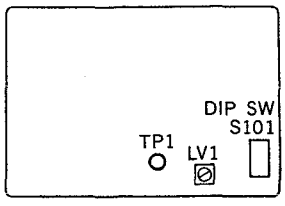
3-3. DITHER ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: RAMP-H Signal (J-9000-010-A) • Connect J101 pin ② to the GND. • Set the POWER switch to ON while pressing the buttons of [PRINT], [COPY] and [FEED] at the same time. Note: Do not release the above button until READY lamp lights. • In order to print out, make J101 Pin ② open once and repeat short circuit with GND.	Adjust RV3 to meke of equal the interval of gredation as shown in Fig. 1. Note: For dither adjustment, it can be done easily by fully turning Head Voltage Adjusting knob RV671 clockwise. ※However, Head Voltage adjustment should be made after finishing adjustment.  Fig. 2	◐RV3/F-5(MA-3)  

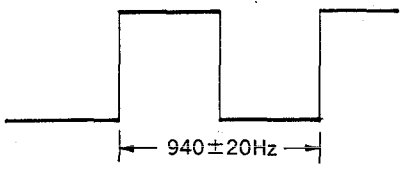
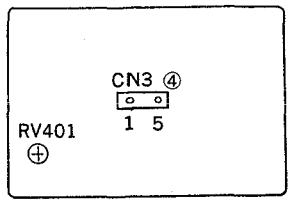
3-4. BRIGHTNESS CONTRAST ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: 10 step signal (1410 Signal generator) • Set the knobs of [CONTR], [BRT] to the center position.	 TP4	◐RV1/F-4(MA-3) ◐RV2/F-4(MA-3) 

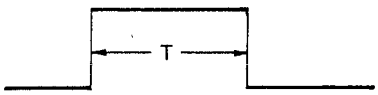
3-5. TRAP ADJUSTMENT

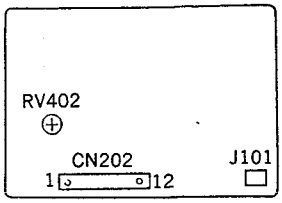
machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: Color-bar • Set the trap of DIP switch to ON.	 TP1	⊘LV1/F-2(MA-3) 

3-6. MOTOR SPEED ADJUSTMENT

machine conditions for adjustment	spec.	adjustment
• VIDEO IN JACK: Color-bar • While pressing the buttons of [FEED] and [PRINT], measure the waveform (frequency) at Pin ④ of CN3.	 CN3 ④	⊘RV401/E-9(MA-3) 

3-7. TEMPERATURE-COMPENSATING CIRCUIT ADJUSTMENT

<table>
<tr><th>machine conditions for adjustment</th><th>spec.</th><th>adjustment</th></tr>
<tr>
<td>• Connect J101 Pin ② and CN202 Pin ⑦ to the GND.
Set the POWER switch to ON while pressing the buttons of [PRINT], [COPY] and [FEED] at the same time.
Note: Do not release the above button until READY lamp lights.
Measuring point of room temperature should be measured around the thermal head.</td>
<td>Adjust RV402 to obtain the suitable temperature pulse according to the room temperature below the table 1.
(Before this adjustment, the power switch is turned to OFF two or three hours.)
<table>
<tr><th>Room temperature (°C)</th><th>Temperature pulse (T)msec</th></tr>
<tr><td>10~12</td><td>15.64~15.33</td></tr>
<tr><td>12~14</td><td>15.33~15.01</td></tr>
<tr><td>14~16</td><td>15.01~14.68</td></tr>
<tr><td>16~18</td><td>14.68~14.34</td></tr>
<tr><td>18~20</td><td>14.34~14.00</td></tr>
<tr><td>20~22</td><td>14.00~13.65</td></tr>
<tr><td>22~24</td><td>13.65~13.12</td></tr>
<tr><td>24~26</td><td>13.12~12.94</td></tr>
<tr><td>26~28</td><td>12.94~12.58</td></tr>
<tr><td>28~30</td><td>12.58~12.22</td></tr>
</table>
Table. 1
 

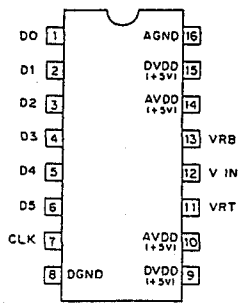
CN202 ⑪</td>
<td>● RV402/E-8(MA-3)
 
</td>
</tr>
</table>

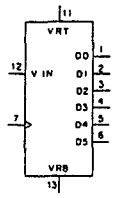
SECTION 4
DIAGRAMS

4-1. SEMICONDUCTOR

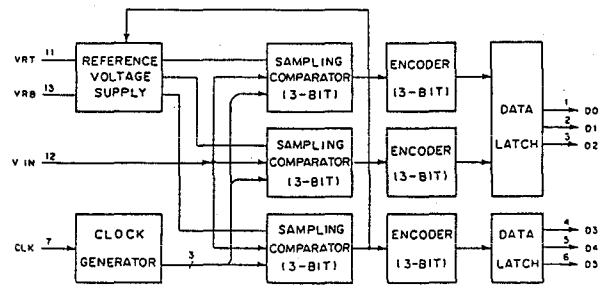
CXD1172P (SONY)

6 BITS 20 MSPS VIDEO A/D CONVERTER
– TOP VIEW –

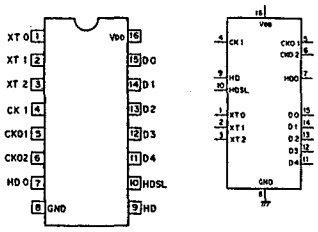




AGND; ANALOG GROUND
AVDD; ANALOG POWER SUPPLY
CLK; CLOCK INPUT
D0-5; DIGITAL DATA OUTPUTS (LSB to MSB)
DGND; DIGITAL GROUND
DVDD; DIGITAL POWER SUPPLY
V IN; ANALOG VOLTAGE INPUT
VRB; BOTTOM REFERENCE VOLTAGE INPUT
VRT; TOP REFERENCE VOLTAGE INPUT

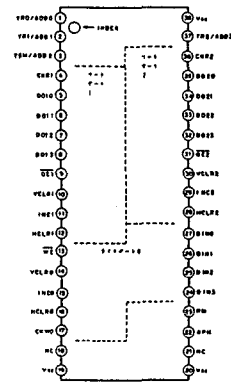


CXD1332P (SONY)
C-MOS
– TOP VIEW –

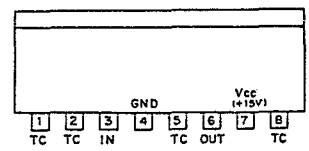


CK1 ; COUNTER CLOCK INPUT
CKO1,02; EXTERNAL COUNTER CLOCK OUTPUTS
D0~D4 ; DATA BUS INPUTS/OUTPUTS
HD ; HD INPUT
HDO ; HD OUTPUT
HDSL ; HD SELECT
XT0~XT2; XTAL INPUTS/OUTPUTS

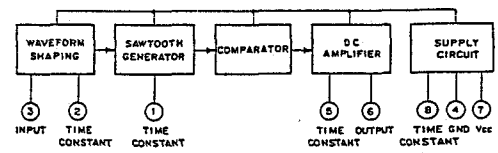
CXK1206M

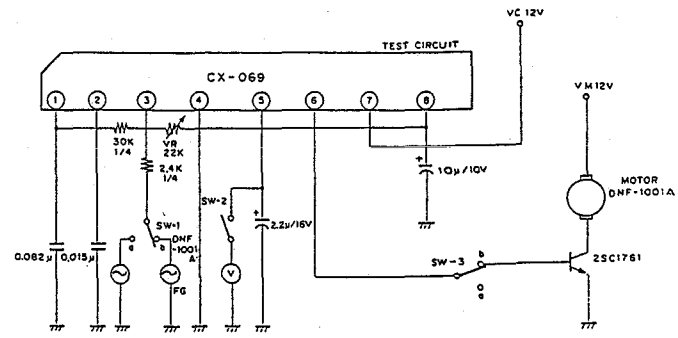


CX069A (MITSUBISHI)
CX069A (SONY)
SERVO AMPLIFIER OF MOTOR OF TAPE RECORDERS
— SIDE VIEW —



TC ; TIME CONSTANT

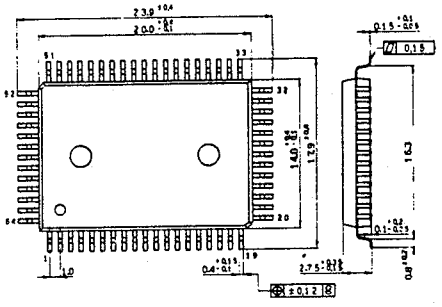


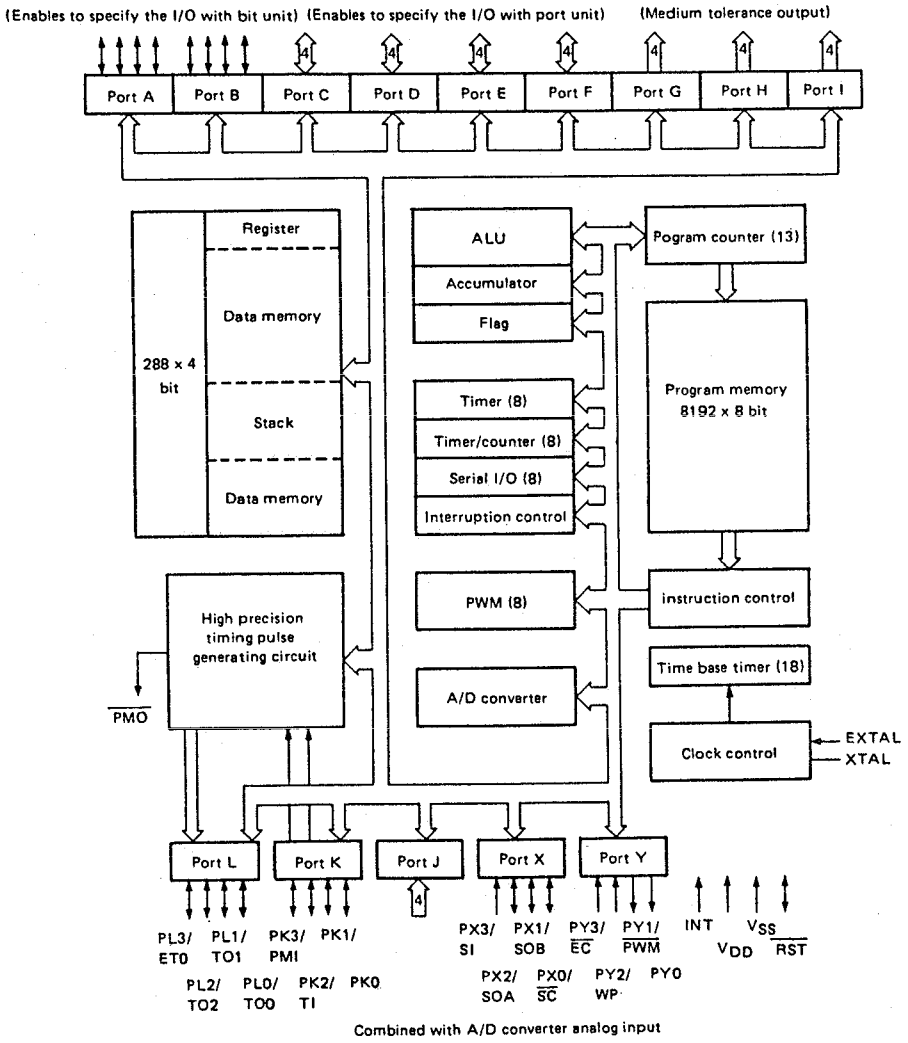


SINE WAVE OSC
1 Vp-p
f = fco ±Δf
fco = 450Hz

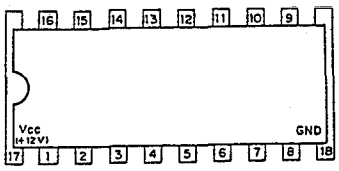
APPLICATION CIRCUIT
① SW-1→b, SW-2→OFF, SW-3→b
F-V CHARACTERISTICS TEST CIRCUIT
② SW-1→a, SW-2→ON, SW-3→a

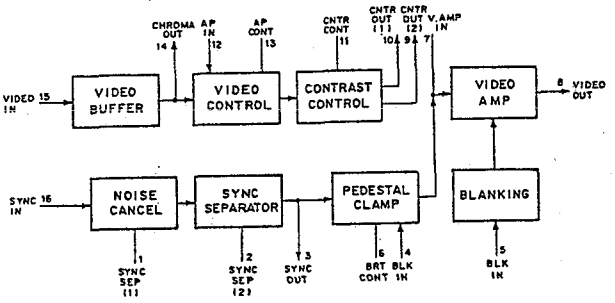
CXP5048 (SONY)
C-MOS 4 BIT 1 CHIP MICROCOMPUTER
— TOP VIEW —





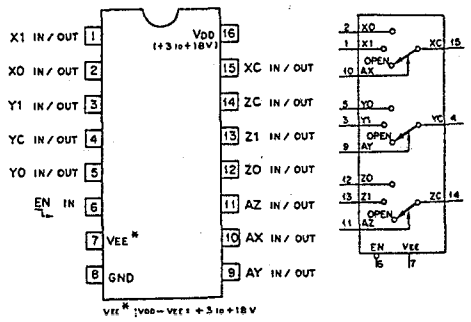
HA11465A (HITACHI)
NTSC COLOR TV VIDEO AMPLIFIER
— TOP VIEW —





AP ; APERTURE
BLK ; BLANKING
BRT ; BRIGHTNESS
CNTR ; CONTRAST
CONT ; CONTROL
SYNC SEP ; SYNCHRONIZATION PULSE SEPARATION
V.AMP ; VIDEO AMPLIFIER

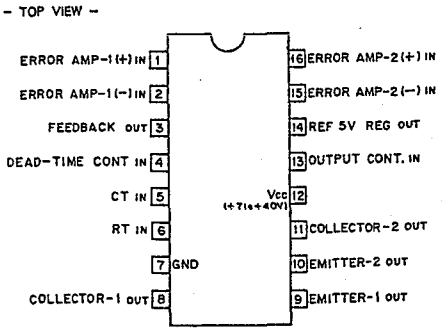
HD14053BP (HITACHI)
C-MOS 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER
— TOP VIEW —

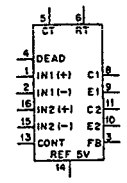

X1 IN / OUT 1
XO IN / OUT 2
Y1 IN / OUT 3
YC IN / OUT 4
YO IN / OUT 5
EN IN 6
VEE * 7
GND 8
VDD (+3 to +18V) 16
15 XC IN / OUT
14 ZC IN / OUT
13 Z1 IN / OUT
12 ZO IN / OUT
11 AZ IN / OUT
10 AX IN / OUT
9 AY IN / OUT
OPEN
VEE * ; VDD − VEE : +3 to +18 V

CONT. INPUTS		ON
EN	A (X,Y,Z)	CHANNEL
0	0	0
0	1	1
1	X	OPEN

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE.

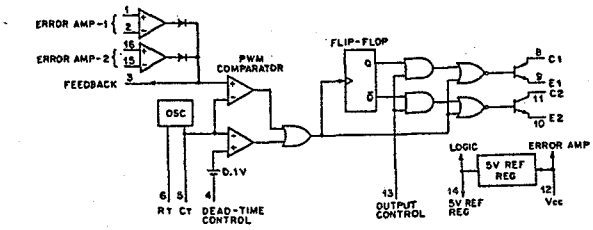
MB3759 (FUJITSU)
PWM POWER CONTROL
— TOP VIEW —



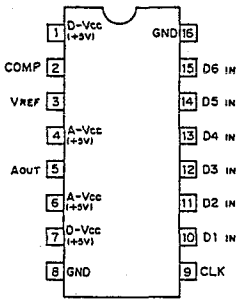


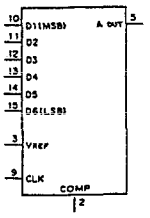
OUTPUT CONTROL	OUTPUT FUNCTION
0	PARALLEL
1	PUSH-PULL

0 ; GROUNDED
1 ; CONNECTED TO PIN 14

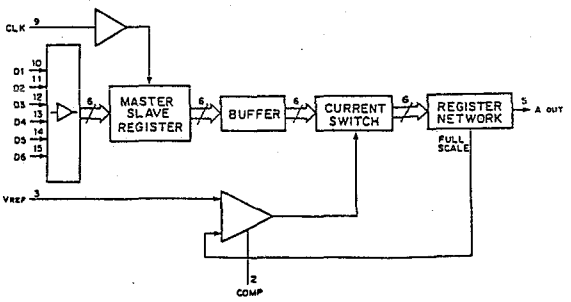


MB40776P (FUJITSU)
6-BIT VIDEO D/A CONVERTER
— TOP VIEW —

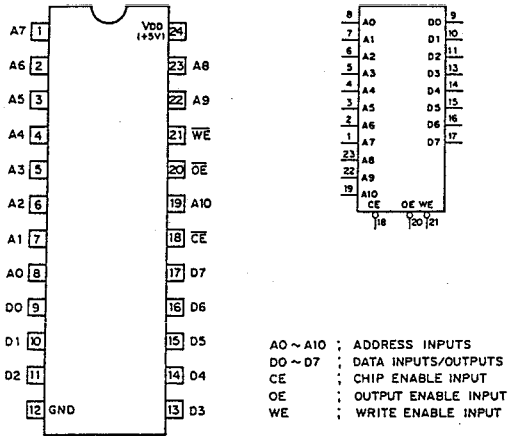




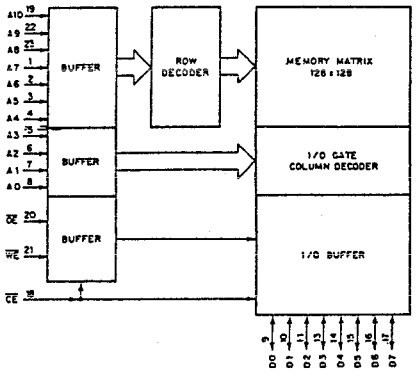
AOUT ; ANALOG OUTPUT
CLK ; CLOCK INPUT
COMP ; COMPENSATION
D1–D6 ; DIGITAL INPUTS
VREF ; REFERENCE VOLTAGE INPUT



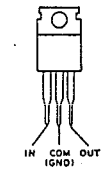
MCM2018N35 (MOTOROLA) (ACCESS TIME = 35nS)
C-MOS 16K(2Kx8) STATIC RAM
— TOP VIEW —



AO ~ A10 ; ADDRESS INPUTS
DO ~ D7 ; DATA INPUTS/OUTPUTS
CE ; CHIP ENABLE INPUT
OE ; OUTPUT ENABLE INPUT
WE ; WRITE ENABLE INPUT



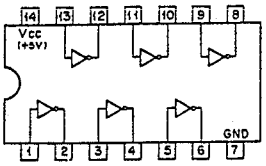
RC7809FA
POSITIVE VOLTAGE REGULATOR (1A)
— SIDE VIEW —

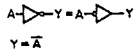


OUTPUT VOLTAGE	AN7877	FS7877	HA17877P	L7877	NJM7877B	NJM7877A/K
+5V	AN7805	FS7805	HA17805P	L7805	--------	NJM7805A/K
+6V	AN7806	-------	HA17806P	------	--------	NJM7806A/K
+7V	AN7807	-------	HA17807P	L7807	--------	----------
+8V	AN7808	-------	HA17808P	------	--------	NJM7808A/K
+8.5V	-------	-------	---------	------	--------	----------
+9V	AN7809	-------	---------	------	--------	NJM7809A/K
+10V	AN7810	-------	---------	------	--------	----------
+12V	AN7812	FS7812	HA17812P	------	NJM7812B	NJM7812A/K
+15V	AN7815	FS7815	HA17815P	------	--------	NJM7815A/K
+18V	AN7818	-------	HA17818P	------	--------	NJM7818A/K
+20V	AN7820	-------	---------	------	--------	NJM7820A/K
+24V	AN7824	FS7824	HA17824P	------	--------	NJM7824A/K

OUTPUT VOLTAGE	uA787?UC	uPC1437?H	uPC787?H	TA787??P/AP
+5V	uA7805UC	uPC14305H	uPC7805H	TA78005P/AP
+6V	uA7806UC	---------	--------	TA78006P/AP
+7V	--------	---------	--------	----------
+8V	uA7808UC	uPC14308H	uPC7808H	TA78008P/AP
+8.5V	uA7885UC	---------	--------	----------
+9V	--------	---------	--------	TA78009P/AP
+10V	--------	---------	--------	TA78010P/AP
+12V	uA7812UC	uPC14312H	uPC7812H	TA78012P/AP
+15V	uA7815UC	uPC14315H	uPC7815H	TA78015P/AP
+18V	uA7818UC	uPC14318H	uPC7818H	TA78018P/AP
+20V	---------	---------	---------	TA78020P/AP
+24V	uA7824UC	uPC14324H	uPC7824H	TA78024P/AP

SN74LS04N (TI)
TTL INVERTER
— TOP VIEW —



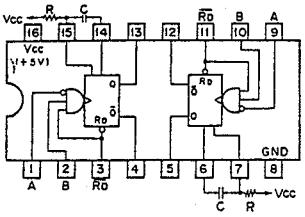


$Y = \overline{A}$

A	Y
0	1
1	0

0: LOW LEVEL
1: HIGH LEVEL

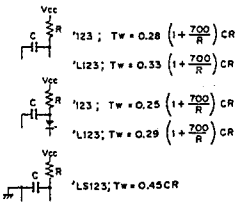
SN74LS123N (TI)
TTL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH DIRECT RESET
— TOP VIEW —



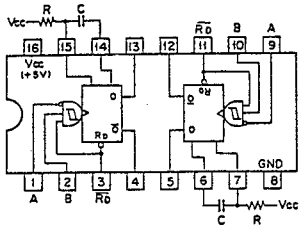
INPUTS			OUTPUTS	
$\overline{RD}$	A	B	Q	$\overline{Q}$
0	X	X	0	1
X	1	X	0	1
X	X	0	0	1
1	0	↑	⎍	⎍
1	↓	1	⎍	⎍
↑	0	1	⎍	⎍

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

OUTPUT PULSE WIDTH



SN74LS221N (TI)
TTL MONOSTABLE MULTIVIBRATOR WITH SCHMITT TRIGGER INPUT
— TOP VIEW —

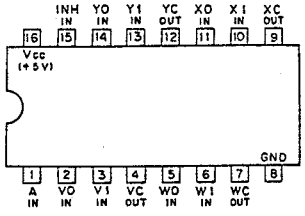


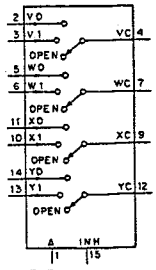
INPUTS			OUTPUTS	
$\overline{RD}$	A	B	Q	$\overline{Q}$
0	X	X	0	1
X	1	X	0	1
X	X	0	0	1
1	0	↑	⎍	⎍
1	↓	1	⎍	⎍
↑	0	1	⎍	⎍

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

OUTPUT PULSE WIDTH = 0.7CR

SN74LS257AN (TI)
TTL 2-LINE-TO-1-LINE DATA SELECTOR/MULTIPLEXER
— TOP VIEW —

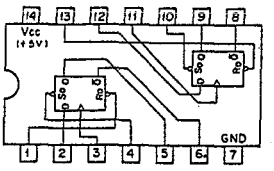




CONT. IN		ON CHANNEL
INH	A	
0	0	0
0	1	1
1	X	OPEN

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

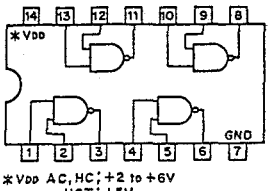
SN74LS74AN (TI)
TTL D-TYPE FLIP FLOP WITH DIRECT SET/RESET
— TOP VIEW —

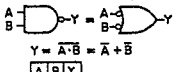


INPUTS				OUTPUTS	
$\overline{S_D}$	$\overline{R_D}$	CK	D	On+1	$\overline{On+1}$
0	1	X	X	1	0
1	0	X	X	0	1
0	0	X	X	1*	1*
1	1	↑	1	1	0
1	1	↑	0	0	1
1	1	0	X	On	$\overline{On}$

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE
t*; NONSTABLE

TC74HC00P (TOSHIBA)
C-MOS 2-INPUT NAND GATE
— TOP VIEW —





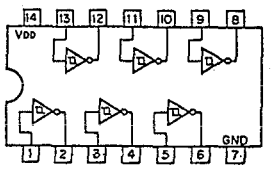
$Y = \overline{A \cdot B} = \overline{A} + \overline{B}$

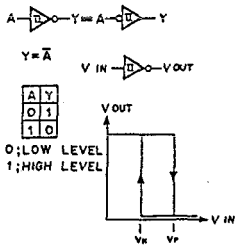
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

0; LOW LEVEL
1; HIGH LEVEL

*VDD AC, HC; +2 to +6V
HCT; +5V

TC74HC14F (TOSHIBA) (V_{DD} = +2 to +6V) FLAT PACKAGE
C-MOS SCHMITT TRIGGER INVERTER
— TOP VIEW —



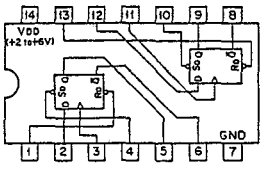


A	Y
0	1
1	0

0; LOW LEVEL
1; HIGH LEVEL

VDD	VH	VL
2.0V	0.75V	1.25V
4.5V	1.9V	2.7V
6.0V	2.6V	3.6V

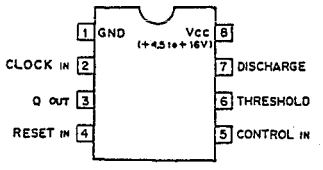
TC74HC74F (TOSHIBA) FLAT PACKAGE
C-MOS D-TYPE FLIP FLOP WITH DIRECT SET/RESET
— TOP VIEW —

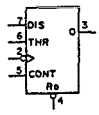


INPUTS				OUTPUTS	
$\overline{S_D}$	$\overline{R_D}$	CK	D	On+1	$\overline{On+1}$
0	1	X	X	1	0
1	0	X	X	0	1
0	0	X	X	1*	1*
1	1	↑	1	1	0
1	1	↑	0	0	1
1	1	0	X	On	$\overline{On}$

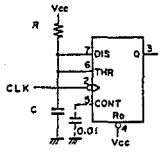
0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE
t*; NONSTABLE

μPC1555C (NEC)
PRECISION TIMER
— TOP VIEW —



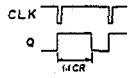


MONOSTABLE MULTIVIBRATOR

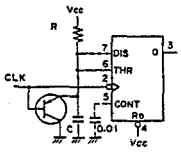


IN PUTS		OUT
RD	CLK	Q
0	X	0
1	↓	↑

0, LOW LEVEL
1, HIGH LEVEL
X, DON'T CARE

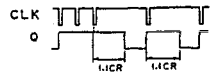


RETRIGGERABLE MONO. MULTIVIBRATOR
(MISSING PULSE DETECTOR)

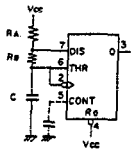


INPUTS		OUT
RD	CLK	Q
0	X	0
1	↓	↑

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

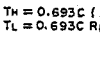


ASTABLE MULTIVIBRATOR



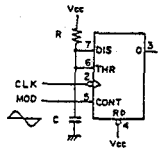
RD	Q
0	0
1	↑↓

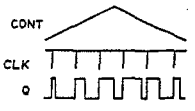
0; LOW LEVEL
1; HIGH LEVEL



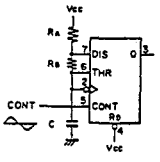
$T_H = 0.693C\,(R_A + R_B)$
$T_L = 0.693C\,R_B$

PULSE WIDTH MODULATOR

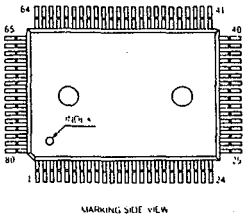




VCO
(PULSE POSITION MODULATOR)

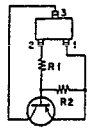


μPD65031GF-395-389



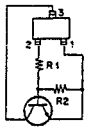
1. SI	11. CPIN	21. PRT4	31. D4	41. AD5	51. HCRO	61. VCR2	71. ADCK
2. VDD	12. INTV	22. GND	32. D5	42. VDD	52. INCO	62. GND	72. DITH
3. GND	13. NEPO	23. VDD	33. GND	43. GND	53. VCRO	63. VDD	73. INEX
4. SCKI	14. FGI	24. PRT5	34. CE	44. AD4	54. WEO	64. CKR2	74. 1221
5. MOTO	15. HCLK	25. PRT6	35. OE	45. AD3	55. HCR1	65. D CLK	75. 1S2N
6. CPST	16. STBO	26. GND	36. WE	46. AD2	56. INC-1	66. HDO	76. ERR
7. FTCH	17. DRO	27. D0	37. AD9	47. AD1	57. VCR1	67. EXTH	77. 3411
8. COPY	18. PRT1	28. D1	38. AD8	48. AD0	58. VMCK	68. MCLK	78. RDWR
9. STBI	19. PRT2	29. D2	39. AD7	49. SELE	59. HCR2	69. EXTV	79. TEST
10. DRI	20. PRT3	30. D3	40. AD6	50. GND	60. INC2	70. FFSF	80. CLR

TOP VIEW (SCALE 4/1)



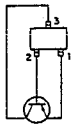
DTA124EK (R1=22K, R2=22K)

TOP VIEW (SCALE 4/1)

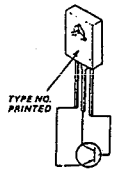


DTC124EK (R1=22K, R2=22K)

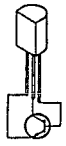
TOP VIEW (SCALE 4/1)



2SA1162

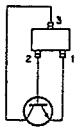


2SB772-Q

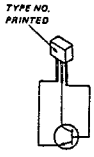


2SC2383

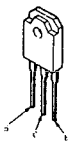
TOP VIEW (SCALE 4/1)



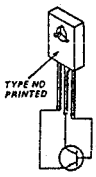
2SC2712-G



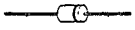
2SC2785-E
2SD1020-F



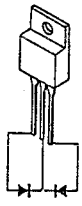
2SC3042-N



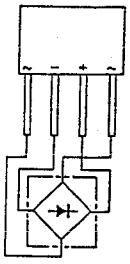
2SD882



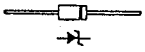
ERC25-06S



ESAC92-02



LB156

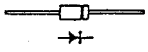


RD13ES-B1
RD20ES-B2
RD5.1ES-B1
RD5.1ES-B2
RD6.2ES-B1
RD7.5ES-B1
RD9.1ES-B1

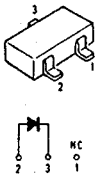
TOP VIEW (SCALE 4/1)

RD3.6M-B2
RD5.6M-B2
RD9.1M-B2

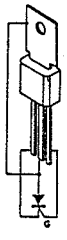
SB340



1SS119
11E2

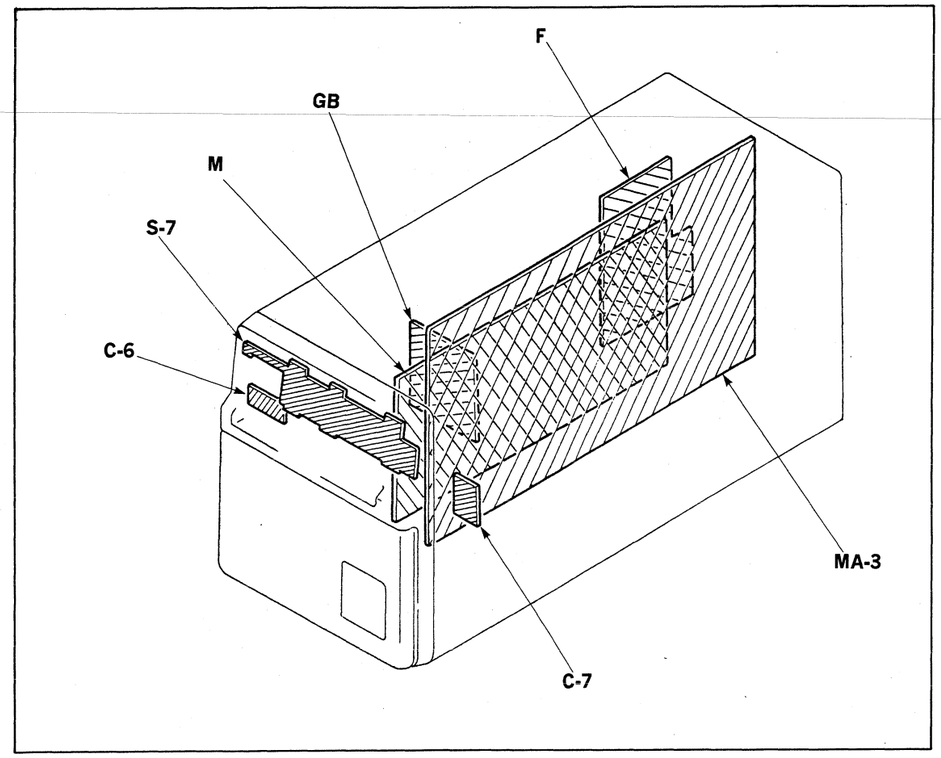


1SS184

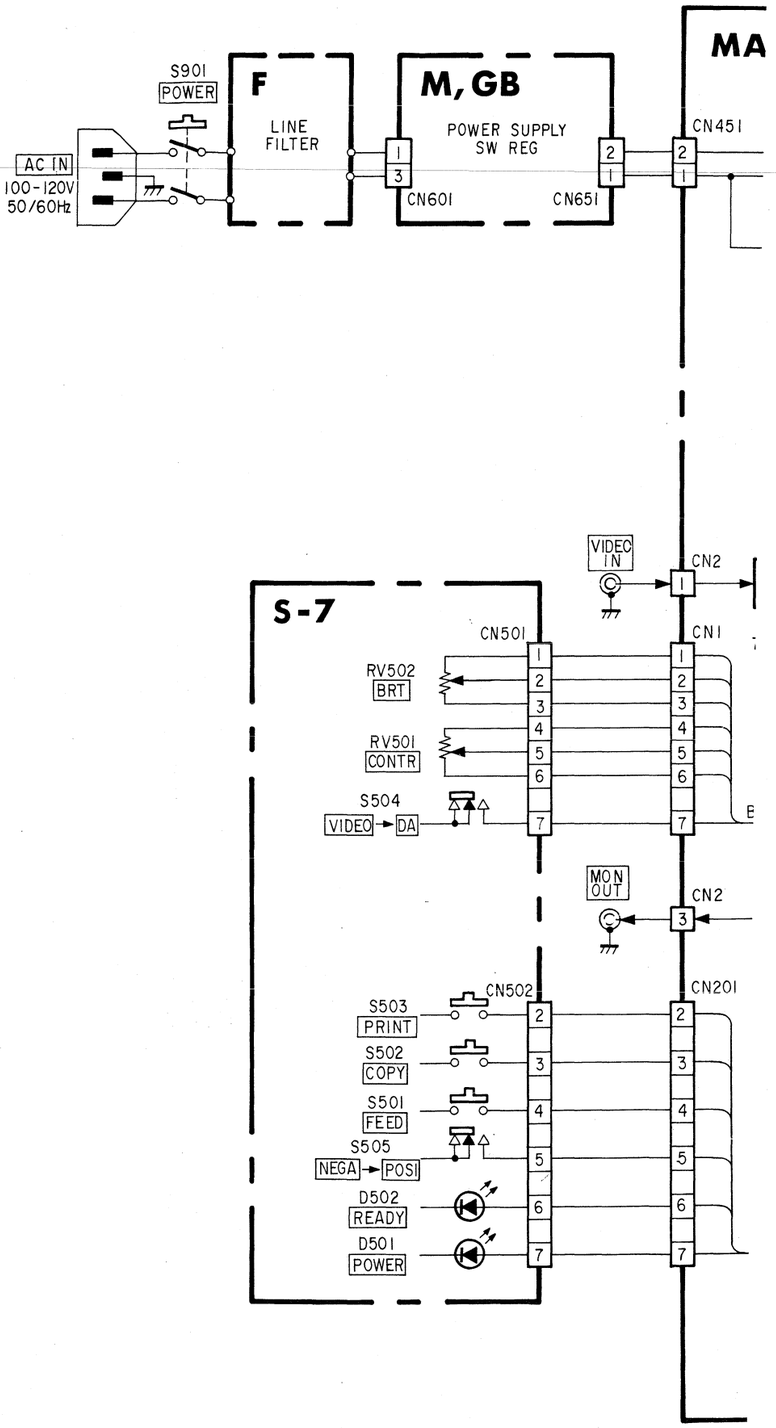


3P4MH

4-2. CIRCUIT BOARDS LOCATION



4-3. BLOCK DIAGRAM



MA-3

B

SUPPLY REG

CN651

CN451

+5V

+12V

9V REG

+9V

X101 13.875MHz

CLOCK OSC

IC101

MASTER CLOCK

SAMPLING CLOCK

HD

IC102,103,104

V,H SYNC SEP

H

V

IC104

FIELD DETECT

IC405

VD GENERATOR

O/E GENERATOR

IC103

CD/EV

VD

IC302,303,304

FRAME MEMORY

DATA

DATA

DATA

IC306,307

DATA SELECTOR

MEMORY CONTROL

IC305

1 LINE MEMORY (S-RAM)

IC301

GATE ARRAY

ADDRESS

HEAD CONTROL

CN301

+5V

THERMAL HEAD

(THERMISTOR)

VIDEO IN

CN2

Q1

INPUT BUFFER

75Ω

TRAP

IC2(1/3) ANALOG SW

IC1

VIDEO AMP SYNC SEP

C.SYNC

DITHER MIX

Q3

Q4,5

L.P.F

Q8,9

CLAMP

IC3

A/D CONVERTER

CLOCK

IC402

TIMER

C-6

CN403

S551

HEAD UP/DOWN

C-7

Q201,202

POWER RESET

GATE ARRAY CONTROL

TEMP. PULSE

IC403

F.G

CN402

+5V

D551

CN402

IC201

CPU

CN401

+9V

IC401,Q401,404

MOTOR SERVO

Q403

MOTOR DRIVE

M

DC MOTOR

Q7

CLAMP PULSE

C.SYNC

CONT

BRT

BRT CONTROL

BRT,CONT,VIDEO/D/A

VIDEO/D/A

MON OUT

CN2

Q13,14

OUTPUT BUFFER

IC2(1/3) ANALOG SW

IC4

D/A CONVERTER

SYNC MIX

IC2(1/3)

IMP HIGH/75Ω

TRAP ON/OFF

SHARPNESS H/L

CN201

S101

PAPER SENSOR

CN404

BUSY

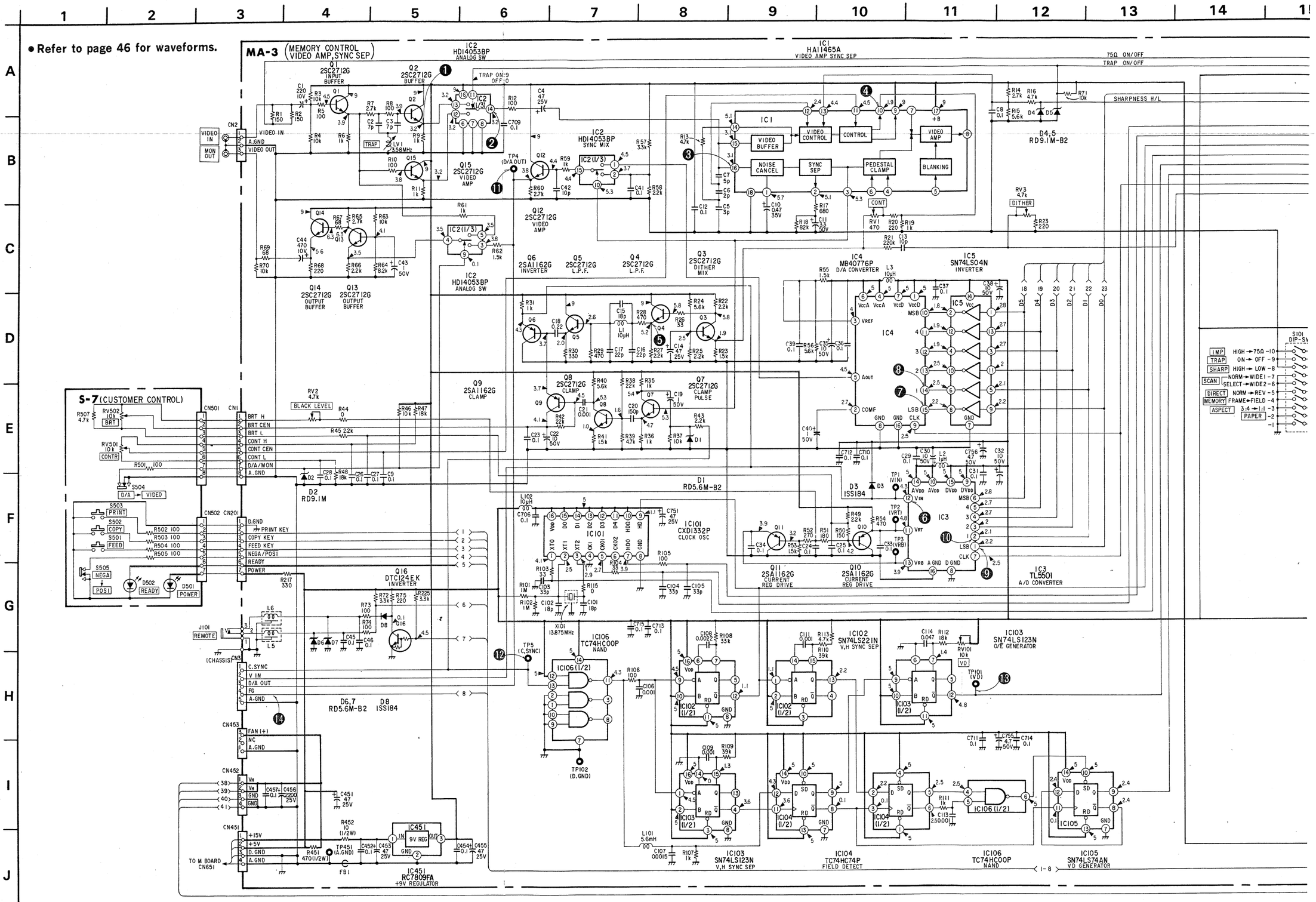
PRINT

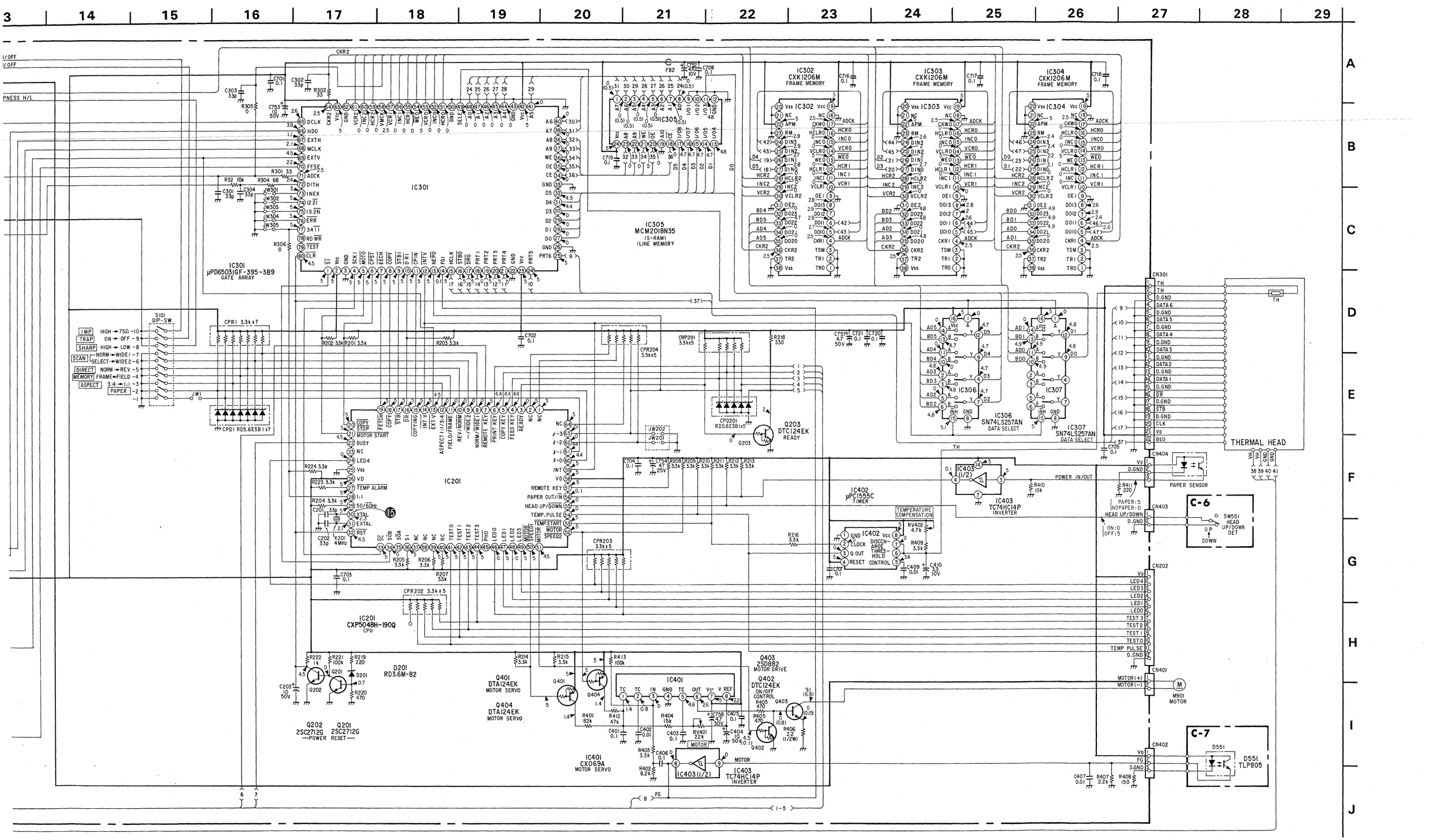
J101

REMOTE

4-4. SCHEMATIC DIAGRAM AND PRINTED WIRING BOARDS

• Refer to page 46 for waveforms.




IC301
μPD6503IGF-395-3B9
GATE ARRAY
IC201
CXP5048H-190Q
CPU
IC305
MCM2018N35
(S-RAM)
(LINE MEMORY
IC302
CXK1206M
FRAME MEMORY
IC303
CXK1206M
FRAME MEMORY
IC304
CXK1206M
FRAME MEMORY
IC306
SN74LS257AN
DATA SELECT
IC307
SN74LS257AN
DATA SELECT
IC401
CX069A
MOTOR SERVO
IC402
μPC1555C
TIMER
IC403
TC74HC14P
INVERTER
IC403(1/2)
TC74HC14P
INVERTER
Q201
2SC2712G
POWER RESET
Q202
2SC2712G
Q203
DTC124EK
READY
Q401
DTA124EK
MOTOR SERVO
Q402
DTC124EK
ON/OFF CONTROL
Q403
2SD882
MOTOR DRIVE
Q404
DTA124EK
MOTOR SERVO
D201
RD3.6M-B2
CKR2
SIOI
DIP-SW
IMP
TRAP
SHARP
SCAN
DIRECT
MEMORY
ASPECT
PAPER
CPRI 3.3k x7
CPDI RD5.6ESB1x7
CPR201 3.3kx5
CPR204 3.3kx5
CPR203 3.3k x5
CPR202 3.3k x5
JWI
JW201
JW202
THERMAL HEAD
TH
PAPER SENSOR
C-6
SW551
HEAD UP/DOWN DET
C-7
D551
TLP805
M901
MOTOR
TEMPERATURE COMPENSATION
RV402 4.7k
RV401 22k
MOTOR
CN301
CN404
CN403
CN202
CN401
CN402
HIGH→75Ω
ON→OFF
HIGH→LOW
NORM→WIDE1
SELECT→WIDE2
NORM→REV
FRAME→FIELD
3:4→1:1
COPY STOP
MOTOR START
BUSY
LED4
TEMP ALARM
50/60Hz
XTAL
EXTAL
RST
PAPER:5
NOPAPER:0
HEAD UP/DOWN
ON:0
OFF:5
UP
DOWN
MOTOR(+)
MOTOR(−)
POWER IN/OUT

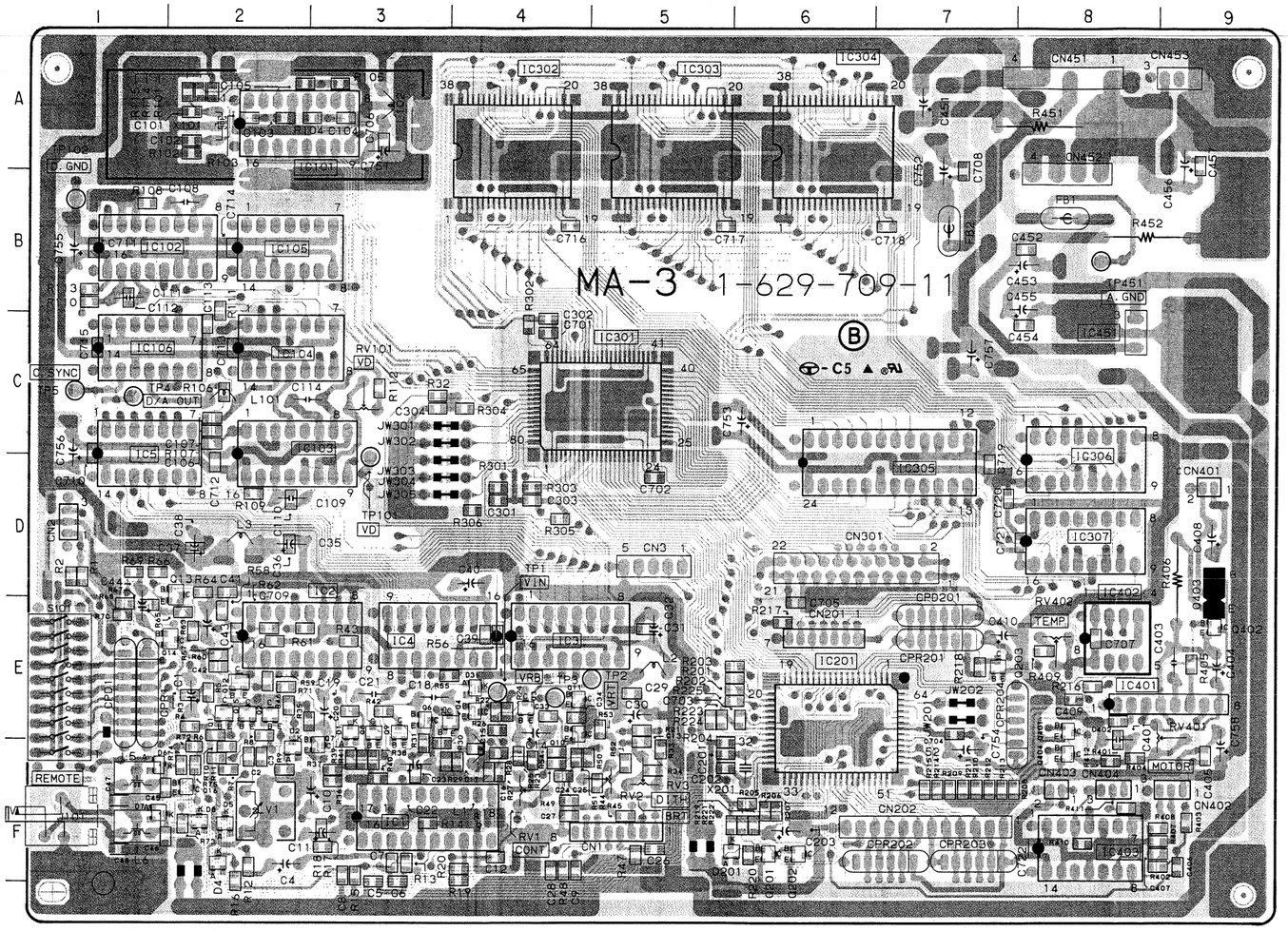
Note:

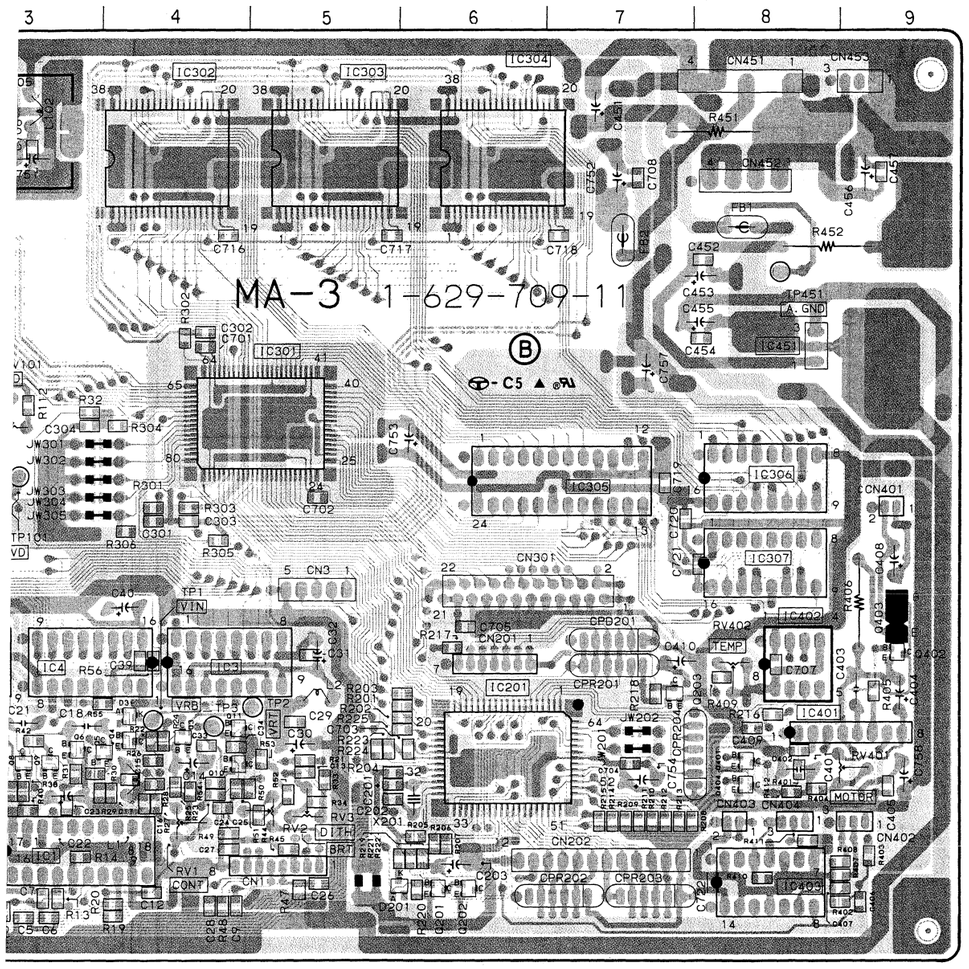
Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par une trame et par une marque ⚠ sont d'une importance critique pour la sécurité. Ne les remplacer que par des pièces de numéro spécifié.

- All capacitors are in μF unless otherwise noted. pF : μμF 50WV or less are not indicated except for electrolytics
- All resistors are in ohms, 1/10W unless otherwise noted. kΩ : 1000Ω, MΩ : 1000kΩ
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
- ▭ : panel designation.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken with a 10MΩ digital multimeter.
- ▭ : adjustment for repair.
- Readigns are taken with color-bar signal input.
- ( ) : Print out mode.
- Voltage variations may be noted due to normal production tolerances.

— MA-3 Board — (Soldering Side)

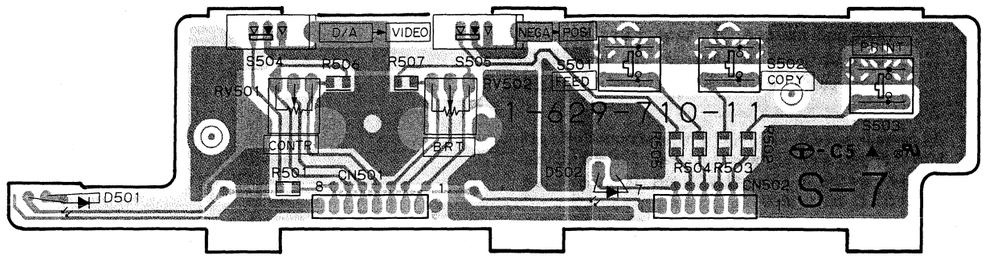




● : soldering side
● : component side

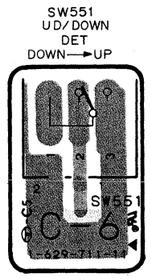
IC		DIODE	
IC1	F-3	D1	E-3
IC2	E-2	D2	F-2
IC3	E-4	D3	E-4
IC4	E-3	D4	F-2
IC5	C-1	D5	F-2
IC101	A-2	D6	F-1
IC102	B-1	D7	F-1
IC103	C-2	D8	F-2
IC104	C-2	D201	F-6
IC105	B-2		
IC106	C-1	**VARIABLE RESISTOR**	
IC201	E-6	RV1	F-4
IC301	C-5	RV2	F-5
IC302	A-4	RV3	F-5
IC303	A-5	RV101	C-3
IC304	A-6	RV401	E-9
IC305	D-7	RV402	E-8
IC306	C-8		
IC307	D-8	**TEST POINT**	
IC401	E-8	TP1	E-4
IC402	E-8	TP2	E-5
IC403	F-8	TP3	E-4
IC451	C-8	TP4	C-1
		TP5	C-1
TRANSISTOR		TP101	C-3
Q1	E-2	TP102	B-1
Q2	E-2	TP451	B-8
Q3	E-4		
Q4	E-4		
Q5	E-3		
Q6	E-3		
Q7	E-3		
Q8	E-3		
Q9	E-3		
Q10	E-4		
Q11	E-4		
Q12	E-2		
Q13	D-2		
Q14	E-2		
Q15	E-2		
Q16	F-2		
Q201	F-6		
Q202	F-6		
Q203	E-7		
Q401	E-8		
Q402	E-9		
Q403	D-9		
Q404	F-8		

— S-7 Board — (Soldering Side)



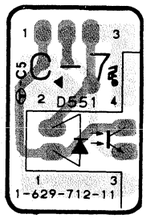
● : soldering side
● : component side

— C-6 Board — (Soldering side)



● : soldering side
● : component side

— C-7 Board — (Soldering Side)



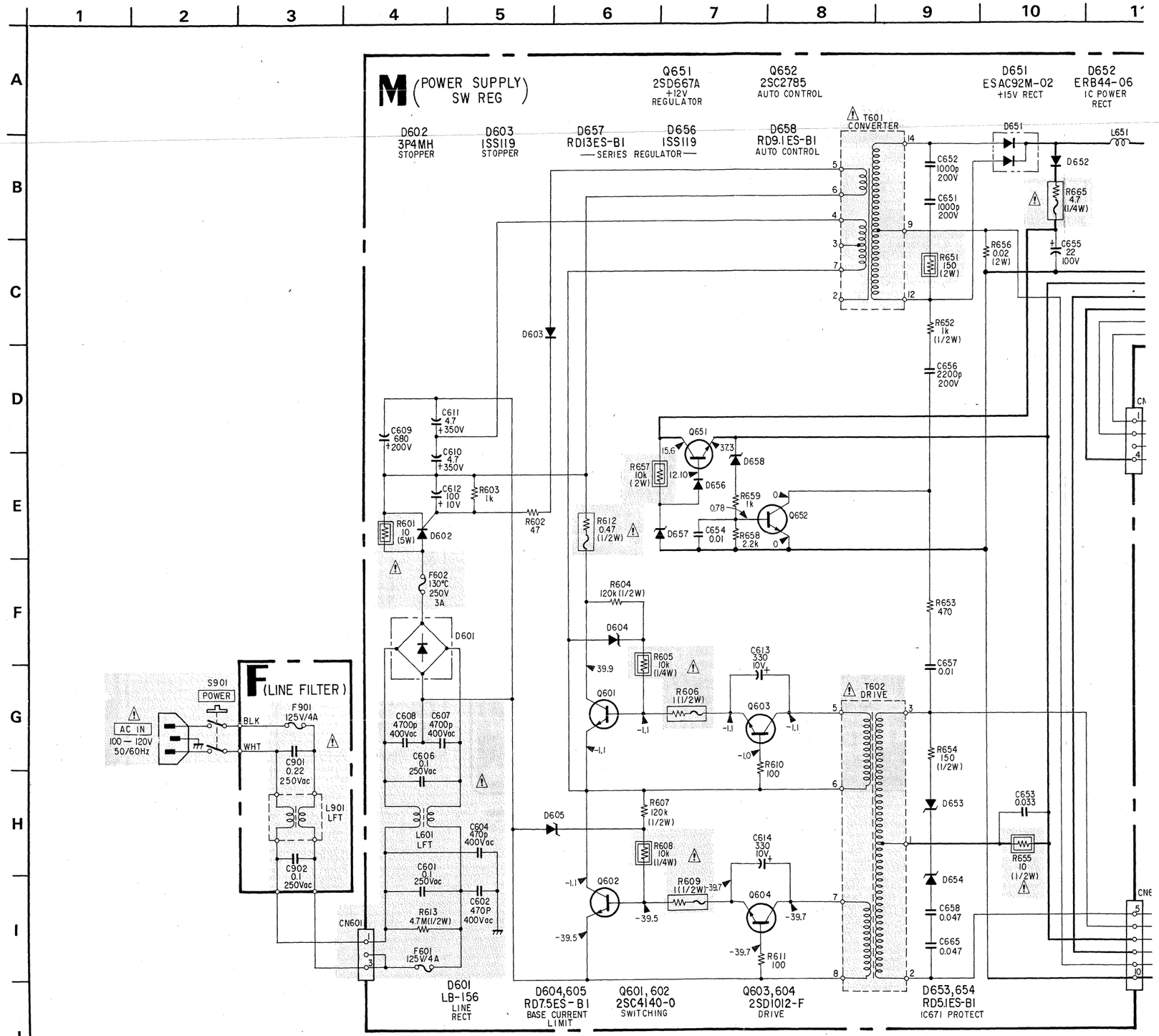
● : soldering side
● : component side

Note:

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par une trame et par une marque ⚠ sont d'une importance critique pour la sécurité. Ne les remplacer que par des pièces de numéro spécifié.

- All capacitors are in μF unless otherwise noted. pF : μμF 50WV or less are not indicated except for electrolytics
- All resistors are in ohms, 1/4W unless otherwise noted. kΩ : 1000Ω, MΩ : 1000kΩ
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
- : nonflammable resistor.
- : fusible resistor.
- : panel designation.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken with a 10MΩ digital multimeter.
- : adjustment for repair.
- Readigns are taken with color-bar signal input.
- Voltage variations may be noted due to normal production tolerances.



3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

A B C D E F G H I J

M (POWER SUPPLY SW REG)

Q651 2SD667A +12V REGULATOR
Q652 2SC2785 AUTO CONTROL
D651 ESAC92M-02 +15V RECT
D652 ERB44-06 IC POWER RECT
D659 ERA15-02 IC POWER STOPPER
Q653 2SB772 SERIES CHOPPER
D655 SB340 FLY WHEEL
D660 RD6.2ES-B1 OVER VOLTAGE PROTECT

D602 3P4MH STOPPER
D603 1SS119 STOPPER
D657 RD13ES-B1 — SERIES REGULATOR —
D656 1SS119
D658 RD9.1ES-B1 AUTO CONTROL

T601 CONVERTER

C652 1000p 200V
C651 1000p 200V
D651
D652
L651
D659
L652
L653
PS651 ICP-N38 1.5A
Q653
L654
R662 0.05(2W)
L655
CN651 +15V +5V GND
TO MA-3 BOARD CN451
R665 4.7 (1/4W)
R656 0.02 (2W)
C655 22 100V
R651 150 (2W)
C659 3300 25V
C660 470 25V
C661 470 25V
R660 220
R661 470 (1/2W)
R664 1.2k
R663 47k
C663 470 25V
C662 1000 6.3V
C664 1000 6.3V
D660
R652 1k (1/2W)
C656 2200p 200V
D603

C611 4.7 +350V
C609 680 +200V
C610 4.7 +350V
C612 100 +10V
R603 1k
R602 47
R601 10 (5W)
D602
F602 130°C 250V 3A
D601
R612 0.47 (1/2W)

Q651
R657 10k (2W)
D658
D656
R659 1k
Q652
D657
C654 0.01
R658 2.2k
R604 120k (1/2W)
D604
R605 10k (1/4W)
Q601
R606 1 (1/2W)
C613 330 10V
Q603
R610 100
T602 DRIVE
R607 120k (1/2W)
D605
R608 10k (1/4W)
Q602
R609 1 (1/2W)
C614 330 10V
Q604
R611 100
R653 470
C657 0.01
R654 150 (1/2W)
D653
D654
C658 0.047
C665 0.047
C653 0.033
R655 10 (1/2W)

F901 125V/4A
C901 0.22 250Vac
L901 LFT
C902 0.1 250Vac
CN601
F601 125V/4A
C608 4700p 400Vac
C607 4700p 400Vac
C606 0.1 250Vac
L601 LFT
C604 470p 400Vac
C601 0.1 250Vac
C602 470P 400Vac
R613 4.7M (1/2W)

D601 LB-156 LINE RECT
D604,605 RD7.5ES-B1 BASE CURRENT LIMIT
Q601, 602 2SC4140-0 SWITCHING
Q603, 604 2SD1012-F DRIVE
D653, 654 RD5.1ES-B1 IC671 PROTECT

CN672

GB (POWER SUPPLY SW REG)

IC672 MB3759 CHOPPER CONTROL
D673 1SS119
D674 RD5.1ES-B1 — OVER VOLTAGE PROTECT —

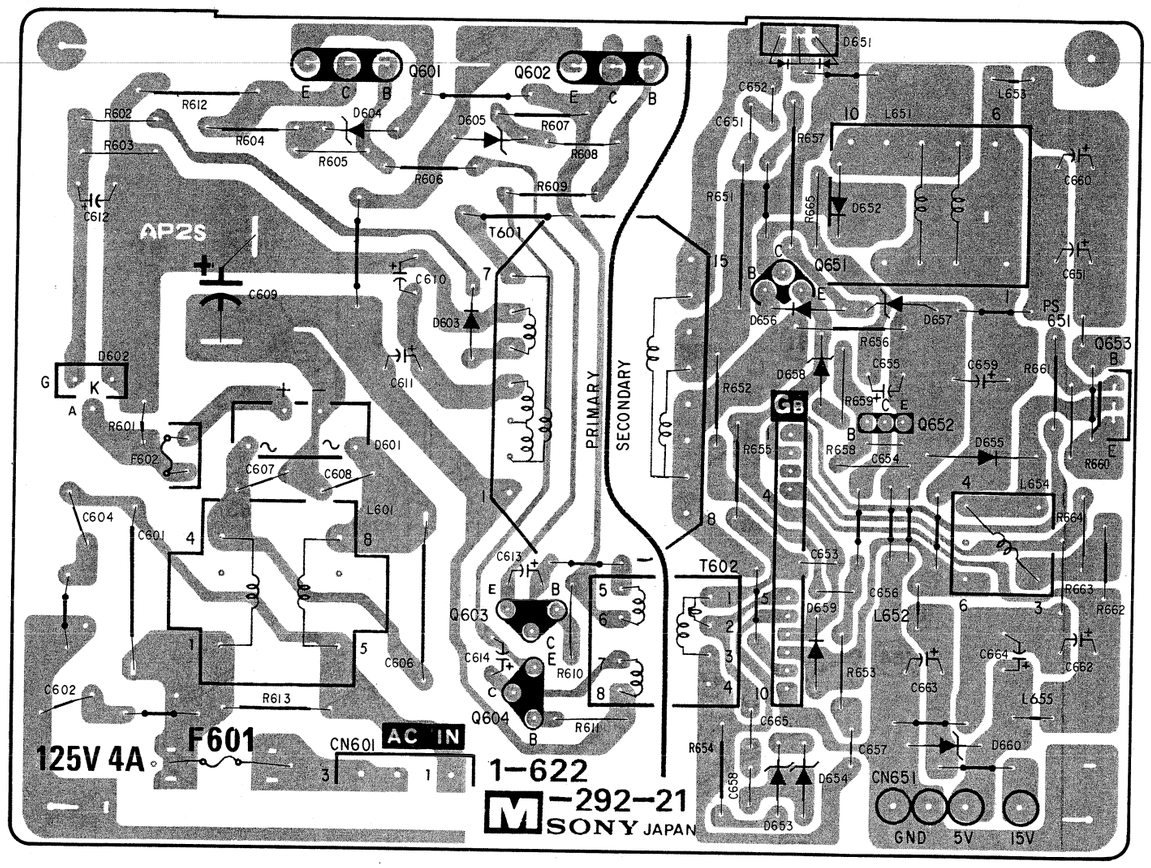
CN671
IC672
R687 680
C677 0.01
R684 100k
R685 2.2k
C676 0.01
R683 5.6k
R681 4.7k
D673
D674
R682 6.8k
R686 1.2k
C671 100 2.5V

D671
IC671 MB3759 MAIN CONTROL
R675 2.2k
C674 0.033
C673 5600p
R676 22k
R674 22k
R688 2.2k
R677 22k
C675 33 35V
R679 560
C678 33 35V
RV671 1k
VOLTAGE
R680 1.2k
R671 680 (1/6W)
R672 33k (1/6W)
R678 4.7k
R673 3.3k
D672
C672 5600p

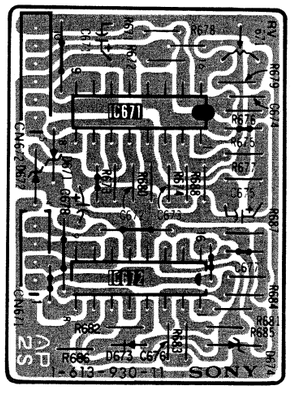
D671 RD20ES-B1 OVER VOLTAGE PROTECT
D672 RD5.1ES-B2 PROTECT

[POWER SUPPLY] M [POWER SUPPLY] GB [LINE FILTER] F

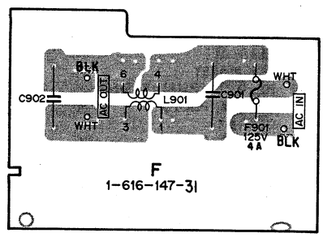
— **M Board** —(Soldering Side)



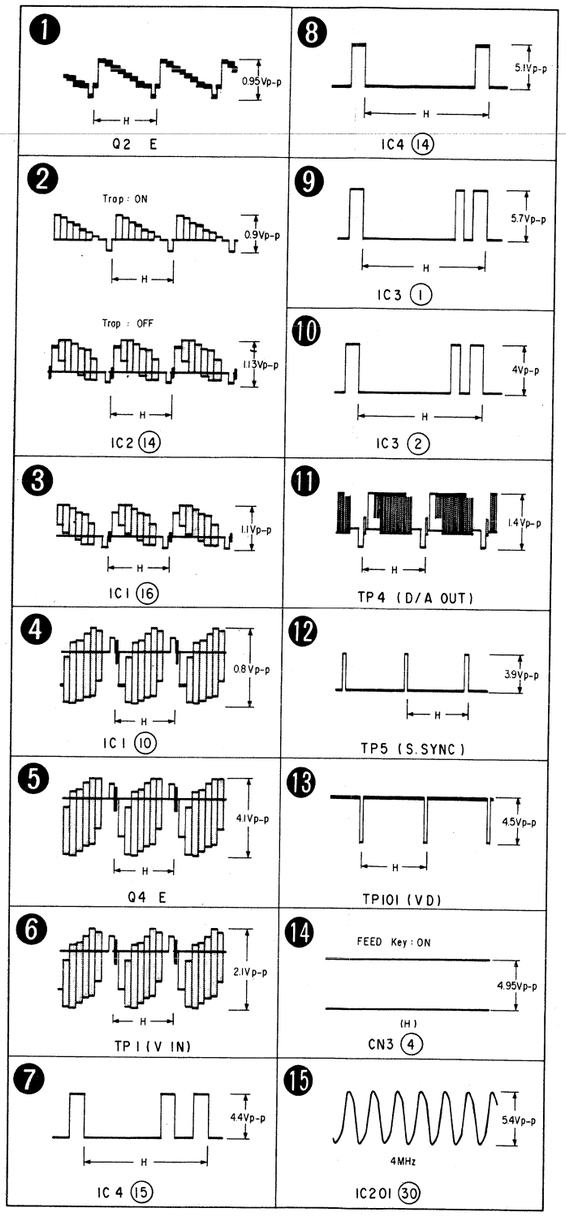
— **GB Board** —(Soldering Side)



— **F Board** —(Soldering Side)



WAVEFORMS



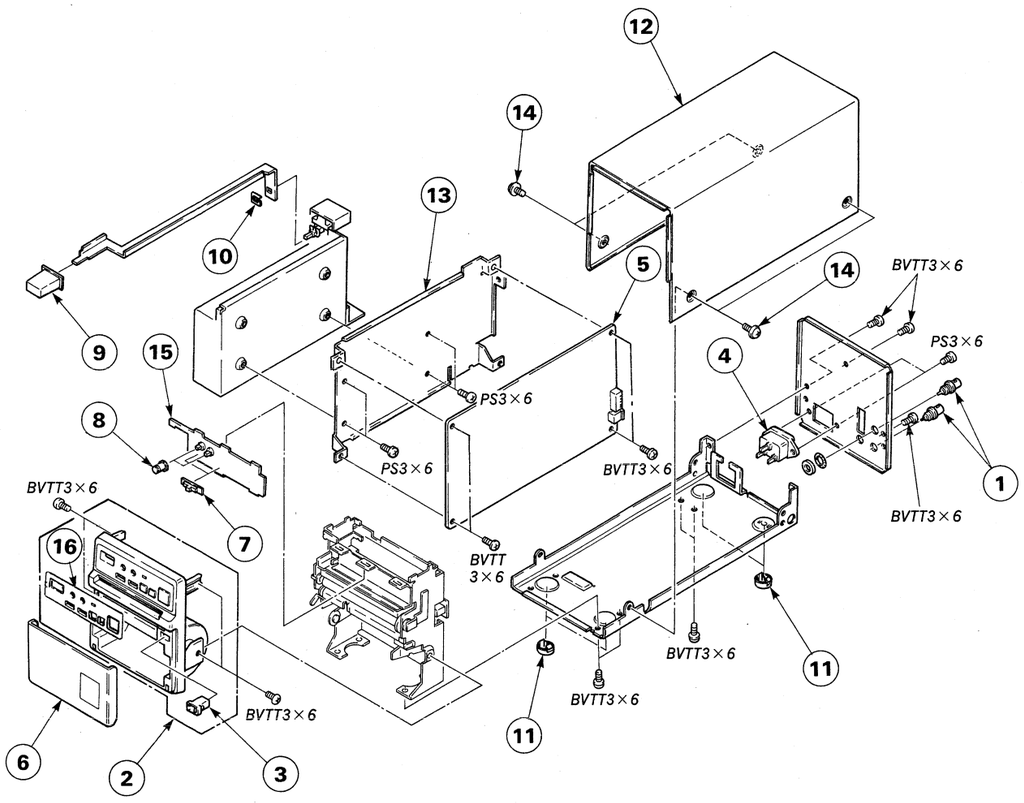
SECTION 5
EXPLODED VIEWS AND PARTS LIST

NOTE:
- Items with no part number and no description are not stocked because they are seldom required for routine service.
- The construction parts of an assembled part are indicated with a collation number in the remark column.
- Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

The components identified by shading and mark ⚠ are critical for safety.
Replace only with part number specified.

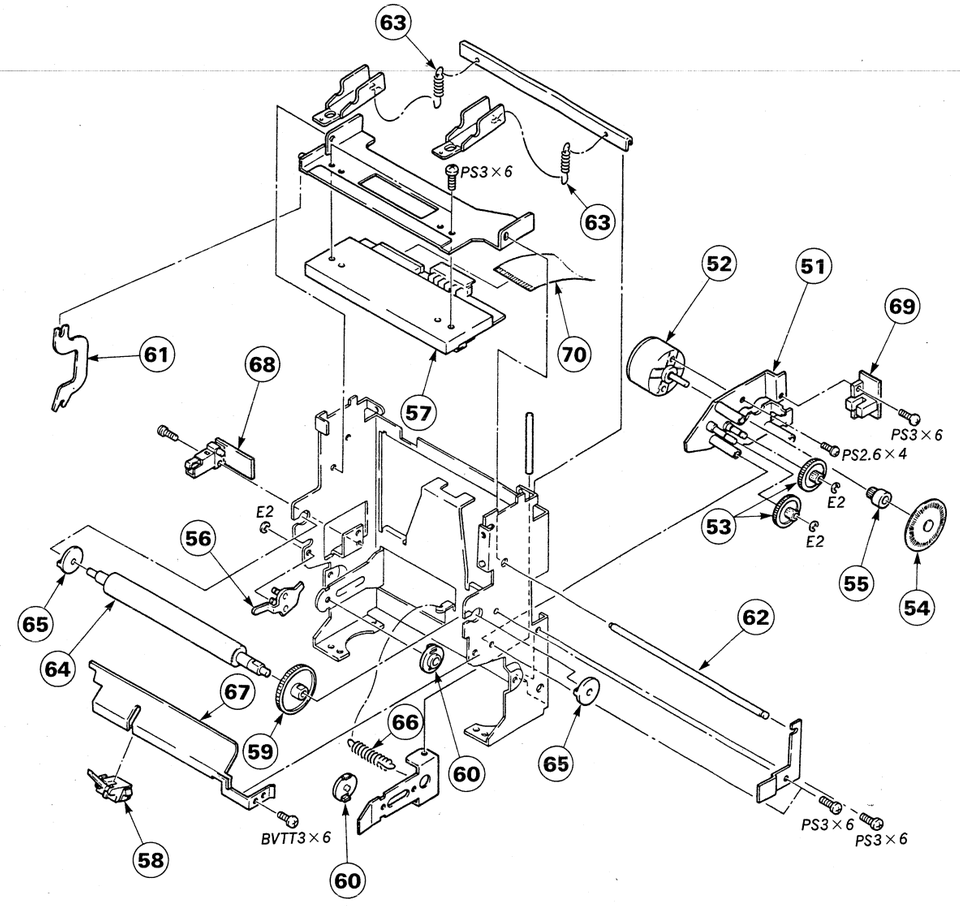
Les composants identifiés par une trame et par une marque ⚠ sont d'une importance critique pour la sécurité.
Ne les remplacer que par des pièces de numéro spécifié.

5-1. CHASSIS ASSEMBLY



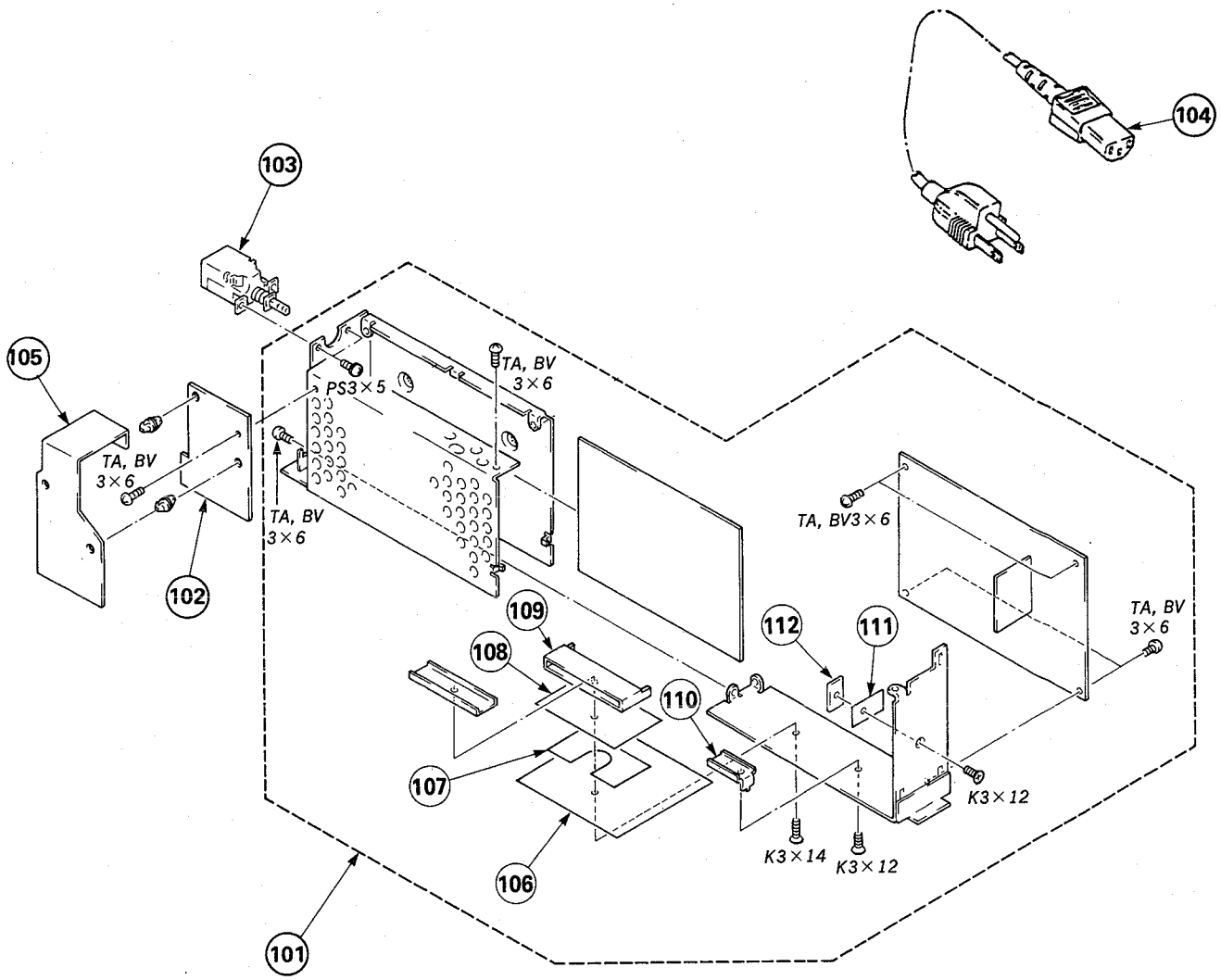
Ref.No	Part No.	Description	Remark
1	1-562-261-21	CONNECTOR, COAXIAL (BNC)	
2	A-8266-040-A	PANEL ASSY, FRONT	3, 16
3	4-374-714-01	CATCHER, PUSH	
4	⚠ 1-560-222-11	3P INLET	
5	* A-8271-053-A	MA-3 BOARD, COMPL	
6	X-3714-938-1	PANEL ASSY, DOOR	
7	2-430-455-31	KNOB, SLIDE	
8	2-431-567-11	KNOB, VOLUME	
9	2-431-568-22	BUTTON, POWER	
10	3-725-616-01	STOPER, LOD	
11	3-734-822-01	FOOT	
12	* 3-734-835-01	COVER, TOP	
13	* 3-734-847-02	HOLDER, PC BOARD	
14	4-886-821-11	SCREW, M3	
15	* 1-629-710-11	S-7 BOARD	
16	3-734-836-03	SHEET, FRONT PANEL	

5-2. PRINT MECHANISM ASSEMBLY



Ref.No	Part No.	Description	Remark
51	* X-3714-933-1	BRACKET ASSY, MOTOR	
52	1-541-163-51	MOTOR	
53	2-430-458-03	GEAR, F	
54	3-734-812-01	FIN, FG	
55	3-734-813-01	GEAR, M	
56	* X-3714-932-1	LEVER ASSY	
57	1-543-588-11	HEAD, THERMAL (TH67604)	
58	1-808-706-11	SENSOR, PHOTO	
59	2-430-457-01	GEAR, A	
60	2-430-461-01	HOLDER, ROLL	
61	3-734-815-01	LINK, HEAD UP	
62	3-734-816-02	SHAFT, HEAD	
63	3-734-817-02	SPRING, COMPRESSION	
64	3-734-818-02	PLATEN	
65	3-734-819-01	BEARING, PLATEN	
66	3-734-821-01	SPRING, COMPRESSION	
67	* 3-734-824-01	GUIDE, PAPER	
68	* 1-629-711-11	C-6 BOARD	
69	* 1-629-712-11	C-7 BOARD	
70	1-574-647-11	CABLE, FLAT	

5-3. POWER SUPPLY ASSEMBLY



Ref.No	Part No.	Description	Remark
101	⚠ *1-413-409-11	REGULATOR, SWITCHING (CR-87)	106-113
102	*1-616-147-31	F BOARD	
103	⚠ 1-554-880-11	SWITCH, PUSH (AC POWER)	
104	⚠ 1-551-812-11	CORD, POWER	
105	*2-431-527-01	COVER, SWITCH	
106	*2-430-430-01	RUBBER, HEAT SINK (STA-CR25)	
107	*2-430-885-00	PLATE, SHILD (SP-SR12E)	
108	⚠ *2-430-235-00	RUBBER, HEAT SINK (STB-SR12E)	
109	*2-430-232-00	PLATE, INSULATING	
110	*2-430-620-00	HOLDER, DIODE	
111	⚠ *2-430-431-01	RUBBER, HEAT SINK (STB-CR25)	
112	*2-430-744-00	HOLDER, TRANSISTOR (TP-SR12)	

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

SECTION 6
ELECTRICAL PARTS LIST

NOTE:

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

When indicating parts by reference number, please include the board name.

• Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

Les composants identifiés par une trame et par une marque ⚠ sont d'une importance critique pour la sécurité. Ne les remplacer que par des pièces de numéro spécifié.

• All variable and adjustable resistors have characteristic curve B, unless otherwise noted.

RESISTORS
• All resistors are in ohms
• F : nonflammable

CAPACITORS
• MF : μF, PF : μμF

COILS
• MMH : mH, UH : μH

Ref.No	Part No.	Description			Remark
	*A-8271-053-A	COMPLETE PCB, MA-3			
		**********			
	*3-734-801-01	HEAT SINK			
	7-682-647-09	SCREW +PS 3X6			
		CAPACITOR			
C1	1-126-176-11	ELECT	220MF	20% 10V	
C2	1-163-090-00	CERAMIC CHIP	7PF	0.25PF 50V	
C3	1-163-090-00	CERAMIC CHIP	7PF	0.25PF 50V	
C4	1-124-477-11	ELECT	47MF	20% 25V	
C5	1-163-086-00	CERAMIC CHIP	3PF	0.25PF 50V	
C6	1-163-085-00	CERAMIC CHIP	2PF	0.25PF 50V	
C7	1-163-088-00	CERAMIC CHIP	5PF	0.25PF 50V	
C8	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C9	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C10	1-131-345-00	TANTALUM	0.47MF	10% 35V	
C11	1-123-382-00	ELECT	3.3MF	20% 50V	
C12	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C13	1-163-093-00	CERAMIC CHIP	10PF	5% 50V	
C14	1-124-477-11	ELECT	47MF	20% 25V	
C15	1-163-099-00	CERAMIC CHIP	18PF	5% 50V	
C16	1-163-101-00	CERAMIC CHIP	22PF	5% 50V	
C17	1-163-101-00	CERAMIC CHIP	22PF	5% 50V	
C18	1-130-499-00	MYLAR	0.22MF	5% 50V	
C19	1-124-499-11	ELECT	1MF	20% 50V	
C20	1-163-121-00	CERAMIC CHIP	150PF	5% 50V	
C21	1-130-471-00	MYLAR	0.001MF	5% 50V	
C22	1-123-875-11	ELECT	10MF	20% 50V	
C23	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C24	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C25	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C26	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C27	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C28	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C29	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C30	1-123-875-11	ELECT	10MF	20% 50V	
C31	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C32	1-123-875-11	ELECT	10MF	20% 50V	
C33	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C34	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C35	1-123-875-11	ELECT	10MF	20% 50V	
C36	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C37	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C38	1-123-875-11	ELECT	10MF	20% 50V	
C39	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C40	1-124-499-11	ELECT	1MF	20% 50V	
C41	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C42	1-163-093-00	CERAMIC CHIP	10PF	5% 50V	
C43	1-124-499-11	ELECT	1MF	20% 50V	
C44	1-124-472-11	ELECT	470MF	20% 10V	
C45	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C46	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C101	1-163-101-00	CERAMIC CHIP	18PF	5% 50V	
C102	1-163-101-00	CERAMIC CHIP	18PF	5% 50V	
C103	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C104	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C105	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C106	1-163-141-00	CERAMIC CHIP	0.001MF	5% 50V	
C107	1-163-145-00	CERAMIC CHIP	0.0015MF	5% 50V	
C108	1-130-475-00	MYLAR	0.0022MF	5% 50V	
C109	1-130-471-00	MYLAR	0.001MF	5% 50V	
C111	1-130-471-00	MYLAR	0.001MF	5% 50V	
C113	1-163-141-00	CERAMIC CHIP	0.001MF	5% 50V	
C114	1-130-491-00	MYLAR	0.047MF	5% 50V	
C201	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C202	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C203	1-123-875-11	ELECT	10MF	20% 50V	
C301	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C302	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C303	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C304	1-163-105-00	CERAMIC CHIP	33PF	5% 50V	
C401	1-130-495-00	MYLAR	0.1MF	5% 50V	
C402	1-163-021-00	CERAMIC CHIP	0.01MF	10% 50V	
C403	1-130-495-00	MYLAR	0.1MF	5% 50V	
C404	1-123-875-11	ELECT	10MF	20% 50V	
C405	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C406	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C407	1-163-021-00	CERAMIC CHIP	0.01MF	10% 50V	
C409	1-163-021-00	CERAMIC CHIP	0.01MF	10% 50V	
C410	1-131-368-00	TANTALUM	3.3MF	10% 10V	
C451	1-124-477-11	ELECT	47MF	20% 25V	
C452	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C453	1-124-477-11	ELECT	47MF	20% 25V	
C454	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C455	1-124-477-11	ELECT	47MF	20% 25V	
C456	1-124-563-11	ELECT	2200MF	20% 25V	
C457	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C701	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C702	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C703	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C704	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C705	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C706	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C707	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C708	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C709	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C710	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C711	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C712	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C713	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C714	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C715	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C716	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C717	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C718	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C719	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C720	1-163-038-00	CERAMIC CHIP	0.1MF	25V	
C721	1-163-038-00	CERAMIC CHIP	0.1MF	25V	

Ref.No	Part No.	Description			Remark
C722	1-163-038-00	CERAMIC CHIP	0.1MF		25V
C751	1-124-477-11	ELECT	47MF	20%	25V
C752	1-124-472-11	ELECT	470MF	20%	10V
C753	1-123-875-11	ELECT	10MF	20%	50V
C754	1-124-477-11	ELECT	47MF	20%	25V
C755	1-124-927-11	ELECT	4.7MF	20%	50V
C756	1-124-927-11	ELECT	4.7MF	20%	50V
C757	1-124-927-11	ELECT	4.7MF	20%	50V
C758	1-124-927-11	ELECT	4.7MF	20%	50V

CONNECTOR

CN1	1-506-473-11	PIN, CONNECTOR 8P
CN2	1-506-468-11	PIN, CONNECTOR 3P
CN3	*1-560-893-00	PIN, CONNECTOR 5P
CN201	1-506-472-11	PIN, CONNECTOR 7P
CN202	*1-560-900-00	PIN, CONNECTOR 12P
CN301	1-562-966-21	SOCKET, CONNECTOR 22P
CN401	*1-506-467-11	PIN, CONNECTOR 2P
CN402	1-506-468-11	PIN, CONNECTOR 3P
CN403	*1-506-467-11	PIN, CONNECTOR 2P
CN404	1-506-468-11	PIN, CONNECTOR 3P
CN451	*1-564-421-11	HEADER, SPRING (POWER) 4P
CN452	*1-564-241-00	PIN, CONNECTOR 4P
CN453	*1-560-891-00	PIN, CONNECTOR 3P

COMPOSITION CIRCUIT BLOCK

CPD1	1-233-189-11	COMPOSITION CIRCUIT BLOCK RD5.6ES-B1X7
CPD201	1-233-188-11	COMPOSITION CIRCUIT BLOCK RD5.6ES-B1X5
CPR1	1-233-165-11	COMPOSITION CIRCUIT BLOCK 3.3K X 7
CPR201	1-233-164-11	COMPOSITION CIRCUIT BLOCK 3.3K X 5
CPR202	1-233-164-11	COMPOSITION CIRCUIT BLOCK 3.3K X 5
CPR203	1-233-164-11	COMPOSITION CIRCUIT BLOCK 3.3K X 5
CPR204	1-233-164-11	COMPOSITION CIRCUIT BLOCK 3.3K X 5

DIODE

D1	8-719-105-91	DIODE RD5.6M-B2
D2	8-719-106-44	DIODE RD9.1M-B2
D3	8-719-801-78	DIODE 1SS184
D4	8-719-106-44	DIODE RD9.1M-B2
D5	8-719-106-44	DIODE RD9.1M-B2
D6	8-719-105-91	DIODE RD5.6M-B2
D7	8-719-105-91	DIODE RD5.6M-B2
D8	8-719-801-78	DIODE 1SS184
D201	8-719-105-52	DIODE RD3.6M-B2

FERRITE BEAD

FB1	1-410-397-21	FERRITE BEAD INDUCTOR
FB2	1-410-397-21	FERRITE BEAD INDUCTOR

IC

IC1	8-759-304-10	IC HA11465A
IC2	8-759-340-53	IC HD14053BP
IC3	8-759-978-95	IC TL5501
IC4	8-759-939-10	IC MB40776P
IC5	8-759-900-04	IC SN74LS04N
IC101	8-759-140-94	IC CXD1332P
IC102	8-759-902-21	IC SN74LS221N
IC103	8-759-901-23	IC SN74LS123N
IC104	8-759-000-XX	IC TC74HC74P
IC105	8-759-900-74	IC SN74LS74AN
IC106	8-759-202-11	IC TC74HC00P
IC201	8-752-810-48	IC CXP5048H-190Q
IC301	8-759-145-41	IC UPD65031GF-395-3B9
IC302	8-752-332-15	IC CXK1206M
IC303	8-752-332-15	IC CXK1206M
IC304	8-752-332-15	IC CXK1206M
IC305	8-752-322-06	IC CXK5814P-35
IC306	8-759-902-57	IC SN74LS257AN
IC307	8-759-902-57	IC SN74LS257AN
IC401	8-750-600-69	IC CX069A
IC402	8-759-115-55	IC UPC1555C
IC403	8-759-202-17	IC TC74HC14P
IC451	8-759-982-10	IC RC7809FA

JACK

J101	1-507-967-11	JACK (REMOTE)

COIL

L1	1-410-470-11	INDUCTOR 10UH
L2	1-408-397-00	INDUCTOR 1UH
L3	1-410-470-11	INDUCTOR 10UH
L5	1-235-096-00	FILTER, LINE
L6	1-235-096-00	FILTER, LINE
L101	1-410-068-11	INDUCTOR 5.6MMH
L102	1-410-470-11	INDUCTOR 10UH

VARIABLE COIL

LV1	1-409-193-00	COIL 3.58MHZ TRAP

TRANSISTOR

Q1	8-729-271-22	TRANSISTOR 2SC2712G
Q2	8-729-271-22	TRANSISTOR 2SC2712G
Q3	8-729-271-22	TRANSISTOR 2SC2712G
Q4	8-729-271-22	TRANSISTOR 2SC2712G
Q5	8-729-271-22	TRANSISTOR 2SC2712G
Q6	8-729-216-22	TRANSISTOR 2SA1162G
Q7	8-729-271-22	TRANSISTOR 2SC2712G
Q8	8-729-271-22	TRANSISTOR 2SC2712G
Q9	8-729-216-22	TRANSISTOR 2SA1162G
Q10	8-729-216-22	TRANSISTOR 2SA1162G
Q11	8-729-216-22	TRANSISTOR 2SA1162G
Q12	8-729-271-22	TRANSISTOR 2SC2712G
Q13	8-729-271-22	TRANSISTOR 2SC2712G
Q14	8-729-271-22	TRANSISTOR 2SC2712G
Q15	8-729-271-22	TRANSISTOR 2SC2712G
Q16	8-729-901-00	TRANSISTOR DTC124EK
Q201	8-729-271-22	TRANSISTOR 2SC2712G
Q202	8-729-271-22	TRANSISTOR 2SC2712G
Q203	8-729-901-00	TRANSISTOR DTC124EK
Q401	8-729-901-05	TRANSISTOR DTA124EK
Q402	8-729-901-00	TRANSISTOR DTC124EK
Q403	8-729-188-24	TRANSISTOR 2SD882
Q404	8-729-901-05	TRANSISTOR DTA124EK

RESISTOR

R1	1-216-029-00	METAL GLAZE	150	5%	1/10W
R2	1-216-029-00	METAL GLAZE	150	5%	1/10W
R3	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R4	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R5	1-216-025-00	METAL GLAZE	100	5%	1/10W
R6	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R7	1-216-059-00	METAL GLAZE	2.7K	5%	1/10W
R8	1-216-025-00	METAL GLAZE	100	5%	1/10W
R9	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R10	1-216-025-00	METAL GLAZE	100	5%	1/10W
R11	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R12	1-216-025-00	METAL GLAZE	100	5%	1/10W
R13	1-216-065-00	METAL GLAZE	4.7K	5%	1/10W
R14	1-216-059-00	METAL GLAZE	2.7K	5%	1/10W
R15	1-216-067-00	METAL GLAZE	5.6K	5%	1/10W

Ref.No	Part No.	Description			Remark
R16	1-216-065-00	METAL GLAZE	4.7K	5%	1/10W
R17	1-216-045-00	METAL GLAZE	680	5%	1/10W
R18	1-216-095-00	METAL GLAZE	82K	5%	1/10W
R19	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R20	1-216-033-00	METAL GLAZE	220	5%	1/10W
R21	1-216-105-00	METAL GLAZE	220K	5%	1/10W
R22	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R23	1-216-053-00	METAL GLAZE	1.5K	5%	1/10W
R24	1-216-067-00	METAL GLAZE	5.6K	5%	1/10W
R25	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R26	1-216-013-00	METAL GLAZE	33	5%	1/10W
R27	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R28	1-216-041-00	METAL GLAZE	470	5%	1/10W
R29	1-216-041-00	METAL GLAZE	470	5%	1/10W
R30	1-216-037-00	METAL GLAZE	330	5%	1/10W
R31	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R32	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R33	1-216-295-00	METAL GLAZE	0	5%	1/10W
R35	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R36	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R37	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R38	1-216-081-00	METAL GLAZE	22K	5%	1/10W
R39	1-216-065-00	METAL GLAZE	4.7K	5%	1/10W
R40	1-216-067-00	METAL GLAZE	5.6K	5%	1/10W
R41	1-216-053-00	METAL GLAZE	1.5K	5%	1/10W
R42	1-216-081-00	METAL GLAZE	22K	5%	1/10W
R43	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R44	1-216-295-00	METAL GLAZE	0	5%	1/10W
R45	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R46	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R47	1-216-079-00	METAL GLAZE	18K	5%	1/10W
R48	1-216-079-00	METAL GLAZE	18K	5%	1/10W
R49	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R50	1-216-029-00	METAL GLAZE	150	5%	1/10W
R51	1-216-031-00	METAL GLAZE	180	5%	1/10W
R52	1-216-035-00	METAL GLAZE	270	5%	1/10W
R53	1-216-053-00	METAL GLAZE	1.5K	5%	1/10W
R54	1-216-041-00	METAL GLAZE	470	5%	1/10W
R55	1-216-053-00	METAL GLAZE	1.5K	5%	1/10W
R56	1-216-067-00	METAL GLAZE	5.6K	5%	1/10W
R57	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R58	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R59	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R60	1-216-059-00	METAL GLAZE	2.7K	5%	1/10W
R61	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R62	1-216-053-00	METAL GLAZE	1.5K	5%	1/10W
R63	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R64	1-216-071-00	METAL GLAZE	8.2K	5%	1/10W
R65	1-216-059-00	METAL GLAZE	2.7K	5%	1/10W
R66	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R67	1-216-021-00	METAL GLAZE	68	5%	1/10W
R68	1-216-033-00	METAL GLAZE	220	5%	1/10W
R69	1-216-021-00	METAL GLAZE	68	5%	1/10W
R70	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R71	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R72	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R73	1-216-025-00	METAL GLAZE	100	5%	1/10W
R74	1-216-025-00	METAL GLAZE	100	5%	1/10W
R75	1-216-033-00	METAL GLAZE	220	5%	1/10W
R101	1-216-121-00	METAL GLAZE	1M	5%	1/10W
R102	1-216-121-00	METAL GLAZE	1M	5%	1/10W
R103	1-216-013-00	METAL GLAZE	33	5%	1/10W
R104	1-216-013-00	METAL GLAZE	33	5%	1/10W
R105	1-216-025-00	METAL GLAZE	100	5%	1/10W
R106	1-216-025-00	METAL GLAZE	100	5%	1/10W
R107	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R108	1-216-085-00	METAL GLAZE	33K	5%	1/10W
R109	1-216-748-11	METAL GLAZE	39K	5%	1/10W
R110	1-216-748-11	METAL GLAZE	39K	5%	1/10W
R111	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R112	1-216-079-00	METAL GLAZE	18K	5%	1/10W
R113	1-216-065-00	METAL GLAZE	4.7K	5%	1/10W
R115	1-216-295-00	METAL GLAZE	0	5%	1/10W
R201	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R202	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R203	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R204	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R205	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R206	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R207	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R208	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R209	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R210	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R211	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R212	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R213	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R214	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R215	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R216	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R217	1-216-037-00	METAL GLAZE	330	5%	1/10W
R218	1-216-037-00	METAL GLAZE	330	5%	1/10W
R219	1-216-033-00	METAL GLAZE	220	5%	1/10W
R220	1-216-041-00	METAL GLAZE	470	5%	1/10W
R221	1-216-097-00	METAL GLAZE	100K	5%	1/10W
R222	1-216-049-00	METAL GLAZE	1K	5%	1/10W
R223	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R224	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R225	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R301	1-216-013-00	METAL GLAZE	33	5%	1/10W
R302	1-216-013-00	METAL GLAZE	33	5%	1/10W
R304	1-216-021-00	METAL GLAZE	68	5%	1/10W
R305	1-216-295-00	METAL GLAZE	0	5%	1/10W
R306	1-216-295-00	METAL GLAZE	0	5%	1/10W
R401	1-216-095-00	METAL GLAZE	82K	5%	1/10W
R402	1-216-071-00	METAL GLAZE	8.2K	5%	1/10W
R403	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R404	1-216-077-00	METAL GLAZE	15K	5%	1/10W
R405	1-216-041-00	METAL GLAZE	470	5%	1/10W
R406	1-249-478-11	CARBON	2.2	5%	1/2W
R407	1-216-057-00	METAL GLAZE	2.2K	5%	1/10W
R408	1-216-029-00	METAL GLAZE	150	5%	1/10W
R409	1-216-061-00	METAL GLAZE	3.3K	5%	1/10W
R410	1-216-073-00	METAL GLAZE	10K	5%	1/10W
R411	1-216-033-00	METAL GLAZE	220	5%	1/10W
R412	1-216-089-00	METAL GLAZE	47K	5%	1/10W
R413	1-216-097-00	METAL GLAZE	100K	5%	1/10W
R451	1-247-747-11	CARBON	470	5%	1/2W
R452	1-247-727-11	CARBON	10	5%	1/2W

VARIABLE RESISTOR

RV1	1-228-989-00	RES, ADJ, METAL GLAZE 470 (CONT)
RV2	1-228-993-00	RES, ADJ, METAL GLAZE 4.7K (BLACK LEVEL)
RV3	1-228-993-00	RES, ADJ, METAL GLAZE 4.7K (DITHER)
RV101	1-228-994-00	RES, ADJ, METAL GLAZE 10K (VD)
RV401	1-228-995-00	RES, ADJ, METAL GLAZE 22K (MOTOR)
RV402	1-228-993-00	RES, ADJ, METAL GLAZE 4.7K (TEMP)

SWITCH

S101	1-571-907-21	SWITCH, DIP 10P

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Ref.No	Part No.	Description				Remark
		CRYSTAL				
X101	1-567-905-21	VIBRATOR, CRYSTAL 13.875MHZ				
X201	1-567-192-11	OSCILLATOR, CERAMIC 4MHZ				
**********						
	*1-629-712-11	C-7 BOARD				
		*******				
		DIODE				
D551	8-719-800-95	DIODE TLP805				
**********						
	*1-629-711-11	C-6 BOARD				
		*******				
		SWITCH				
SW551	1-554-241-00	SWITCH, LEVER				
**********						
	*1-629-710-11	S-7 BOARD				
		*******				
		DIODE				
D501	8-719-800-15	DIODE TLG211				
D502	8-719-800-39	DIODE TLY211				
		RESISTOR				
R501	1-216-025-00	METAL GLAZE	100	5%	1/10W	
R502	1-216-025-00	METAL GLAZE	100	5%	1/10W	
R503	1-216-025-00	METAL GLAZE	100	5%	1/10W	
R504	1-216-025-00	METAL GLAZE	100	5%	1/10W	
R505	1-216-025-00	METAL GLAZE	100	5%	1/10W	
R507	1-216-065-00	METAL GLAZE	4.7K	5%	1/10W	
		VARIABLE RESISTOR				
RV501	1-237-776-11	RES, VAR, CARBON 10K (CONTR)				
RV502	1-237-776-11	RES, VAR, CARBON 10K (BRT)				
		SWITCH				
S501	1-554-303-21	SWITCH, KEY BOARD (FEED)				
S502	1-554-303-21	SWITCH, KEY BOARD (COPY)				
S503	1-554-303-21	SWITCH, KEY BOARD (PRINT)				
S504	1-570-865-11	SWITCH, SLIDE (VIDEO, D/A)				
S505	1-570-865-11	SWITCH, SLIDE (NEGA, POSI)				
**********						
	*1-616-147-31	F BOARD				
		******				
	*1-533-170-00	HOLDER, FUSE				
		CAPACITOR				
C901	⚠1-136-185-00	FILM	0.22MF	20%	250V	
C902	⚠1-136-212-12	FILM	0.1MF	20%	250V	
		COIL				
L901	⚠1-421-580-00	TRANSFORMER, LINE FILTER (LFT)				

Ref.No	Part No.	Description				Remark
		FUSE				
F901	⚠1-532-598-00	FUSE, GLASS TUBE 4A 125V				
**********						
⚠	*1-413-409-11	REGULATOR, SWITCHING (CR-87)				
		**********				
		M BOARD				
		******				
		CAPACITOR				
C601	⚠1-136-212-12	FILM	0.1MF		250V	
C602	⚠1-161-740-00	CERAMIC	470PF		400V	
C604	⚠1-161-740-00	CERAMIC	470PF		400V	
C606	⚠1-136-212-12	FILM	0.1MF		250V	
C607	⚠1-161-743-00	CERAMIC	4700PF		125V	
C608	⚠1-161-743-00	CERAMIC	4700PF		125V	
C609		ELECT	680MF		200V	
C610	1-124-024-00	ELECT	4.7MF		350V	
C611	1-124-024-00	ELECT	4.7MF		350V	
C612	1-124-443-00	ELECT	100MF		10V	
C613	1-124-604-00	ELECT	330MF		10V	
C614	1-124-604-00	ELECT	330MF		10V	
C651	1-106-343-00	FILM	1000PF		200V	
C652	1-106-343-00	FILM	1000PF		200V	
C653	1-136-159-00	FILM	0.033MF		50V	
C654	1-136-153-00	FILM	0.01MF		50V	
C655	1-124-929-11	ELECT	22MF		100V	
C656	1-108-413-51	FILM	2200PF		200V	
C657	1-136-153-00	FILM	0.01MF		50V	
C658	1-136-161-00	FILM	0.047MF		50V	
C659	1-124-636-00	ELECT	3300MF		25V	
C660	1-124-480-11	ELECT	470MF		25V	
C661	1-124-480-11	ELECT	470MF		25V	
C662	1-124-471-00	ELECT	1000MF		6.3V	
C663	1-124-480-11	ELECT	470MF		25V	
C664	1-124-471-00	ELECT	1000MF		6.3V	
C665	1-136-161-00	FILM	0.047MF		50V	
		CONNECTOR				
CN601	⚠*1-564-420-11	HEADER, SPRING 3P				
		DIODE				
D601	8-719-300-63	DIODE LB156				
D602	8-719-108-30	DIODE 3P4MH				
D603	8-719-911-19	DIODE 1SS119				
D604	8-719-110-02	DIODE RD7.5ES-B1				
D605	8-719-110-02	DIODE RD7.5ES-B1				
D651	8-719-928-19	DIODE ESAC92M-02				
D652	8-719-925-06	DIODE ERC25-06S				
D653	8-719-109-84	DIODE RD5.1ES-B1				
D654	8-719-109-84	DIODE RD5.1ES-B1				
D655	1-807-468-11	DIODE SB340				
D656	8-719-911-19	DIODE 1SS119				
D657	8-719-110-35	DIODE RD13ES-B1				
D658	8-719-110-12	DIODE RD9.1ES-B1				
D659	8-719-200-23	DIODE 11E2				
D660	8-719-109-92	DIODE RD6.2ES-B1				
		FUSE				
F601	⚠1-532-746-11	FUSE GLASS, TUBE 4A 125V				
F602	⚠1-532-604-21	FUSE TEMP 130°C 3A 250V				

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Ref.No	Part No.	Description		Remark
		COIL		
L601	⚠ 1-421-694-11	TRANSFOMER, LINE FILTER		
L651	1-421-714-11	COIL, CHOKE		
L652	1-421-459-00	COIL, CHOKE		
L653	1-421-329-00	COIL, CHOKE		
L654	1-410-178-11	COIL, CHOKE		
L655	1-421-329-00	COIL, CHOKE		
		IC LINK		
PS651	⚠ 1-532-675-21	IC LINK ICP-N38 (1.5A)		
		TRANSISTOR		
Q601	8-729-821-53	TRANSISTOR 2SC3042-N		
Q602	8-729-821-53	TRANSISTOR 2SC3042-N		
Q603	8-729-102-04	TRANSISTOR 2SD1012-F		
Q604	8-729-102-04	TRANSISTOR 2SD1012-F		
Q651	8-729-238-32	TRANSISTOR 2SC2383		
Q652	8-729-178-55	TRANSISTOR 2SC2785-E		
Q653	8-729-177-22	TRANSISTOR 2SB772-Q		
		RESISTOR		
R601	⚠ 1-205-939-11	CEMENTED	10 5W F	
R602	1-249-401-11	CARBON	47 1/4W	
R603	1-249-417-11	CARBON	1K 1/4W	
R604	1-214-915-00	CARBON	120K 1/2W	
R605	⚠ 1-247-725-11	CARBON	10K 1/4W F	
R606	⚠ 1-212-934-00	FUSED	1 1/2W F	
R607	1-214-915-00	CARBON	120K 1/2W	
R608	⚠ 1-247-725-11	CARBON	10K 1/4W F	
R609	⚠ 1-212-934-00	FUSED	1 1/2W F	
R610	1-249-405-11	CARBON	100 1/4W	
R611	1-249-405-11	CARBON	100 1/4W	
R612	⚠ 1-217-418-00	FUSED	0.47 1/2W F	
R613	⚠ 1-202-727-00	SOLID	4.7M 1/2W	
R651	⚠ 1-215-887-00	METAL OXIDE	150 2W F	
R652	1-247-752-11	CARBON	1K 1/2W	
R653	1-249-413-11	CARBON	470 1/4W	
R654	1-247-741-11	CARBON	150 1/2W	
R655	⚠ 1-247-727-11	CARBON	10 1/2W F	
R656	1-535-369-11	SHUNT	0.02 2W	
R657	⚠ 1-215-898-11	METAL OXIDE	10K 2W F	
R658	1-249-421-11	CARBON	2.2K 1/4W	
R659	1-249-417-11	CARBON	1K 1/4W	
R660	1-249-409-11	CARBON	220 1/4W	
R661	⚠ 1-247-747-11	CARBON	470 1/2W F	
R662	⚠ 1-217-625-00	METAL OXIDE	0.05 2W F	
R663	1-249-437-11	CARBON	47K 1/4W	
R664	1-249-418-11	CARBON	1.2K 1/4W	
R665	⚠ 1-212-849-00	FUSED	4.7 1/4W F	
		TRANSFORMER		
T601	⚠ 1-448-509-11	TRANSFORMER, CONVERTER		
T602	⚠ 1-437-166-11	TRANSFORMER, DRIVE		

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GB BOARD
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Ref.No	Part No.	Description		Remark
		CAPACITOR		
C671	1-124-478-91	ELECT	100MF	25V
C672	1-130-480-00	FILM	5600PF	50V
C673	1-130-480-00	FILM	5600PF	50V
C674	1-136-159-00	FILM	0.033MF	50V
C675	1-124-482-11	ELECT	33MF	35V
C676	1-136-153-00	FILM	0.01MF	50V
C677	1-136-153-00	FILM	0.01MF	50V
C678	1-124-482-11	ELECT	33MF	35V
		CONNECTOR		
CN671	*1-564-605-11	PIN, CONNECTOR 4P		
CN672	*1-564-820-11	PIN, CONNECTOR 6P		
		DIODE		
D671	8-719-110-53	DIODE RD20ES-B1		
D672	8-719-109-85	DIODE RD5.1ES-B2		
D673	8-719-911-19	DIODE 1SS119		
D674	8-719-109-84	DIODE RD5.1ES-B1		
		IC		
IC671	8-759-937-59	IC MB3759		
IC672	8-759-906-62	IC MB3759-SNY		
		RESISTOR		
R671	1-215-417-00	METAL OXIDE	680	1/6W
R672	1-215-457-00	METAL OXIDE	33K	1/6W
R673	1-249-423-11	CARBON	3.3K	1/4W
R674	1-249-433-11	CARBON	22K	1/4W
R675	1-249-421-11	CARBON	2.2K	1/4W
R676	1-249-433-11	CARBON	22K	1/4W
R677	1-249-433-11	CARBON	22K	1/4W
R678	1-249-425-11	CARBON	4.7K	1/4W
R679	1-249-414-11	CARBON	560	1/4W
R680	1-249-418-11	CARBON	1.2K	1/4W
R681	1-249-425-11	CARBON	4.7K	1/4W
R682	1-249-427-11	CARBON	6.8K	1/4W
R683	1-249-426-11	CARBON	5.6K	1/4W
R684	1-249-441-11	CARBON	100K	1/4W
R685	1-249-421-11	CARBON	2.2K	1/4W
R686	1-249-418-11	CARBON	1.2K	1/4W
R687	1-249-415-11	CARBON	680	1/4W
R688	1-249-421-11	CARBON	2.2K	1/4W
		VARIABLE RESISTOR		
RV671	1-228-644-11	RES, VAR, METAL GLAZE 1K		

****

MISCELLANEOUS
****

M901	1-541-163-00	MOTOR
	1-543-588-11	HEAD, THERMAL (TH67604)
	*1-413-409-11	REGULATOR, SWITCHING (CR87)
	1-562-261-21	CONNECTOR, COAXIAL (BNC)
	⚠ 1-509-546-00	3P INLET
S901	⚠ 1-554-880-11	SWITCH, PUSH (AC POWER) (1 KEY)
	*1-938-614-11	HARNESS, AC

****

ACCESSORY & PACKING MATERIALS
****

	3-701-630-00	BAG, POLYETHYLENE
	*3-734-867-01	INDIVIDUAL CARTON
	*3-734-829-01	CUSHION
	2-430-495-01	SHEET, CLEANING, HEAD
	3-750-627-21	MANUAL, INSTRUCTION
	1-551-475-31	CABLE ASSY
	⚠ 1-551-812-11	CORD, POWER

SECTION 7
CIRCUIT DESCRIPTIONS

7-1. VIDEO CIRCUIT

7-1-1. Operation

The composite video signal input from the BNC connector is input to the MA-3 board from CN2-① and terminated with 75Ω by R1/R2. DIP switch (S101-⑩) determines whether the signal is terminated or not. Then, the signal goes through the input buffer, is divided in two, and is input to an analog switch (IC2-⑫⑬). The original signal is input as is to IC2-⑫, but the signal input to IC2-⑬ has added to it a brilliance signal (Y signal) from which the color subcarrier has been removed in the Trap circuit. One of these two signals is selected by DIP switch S101-⑨ and that signal is output from IC2-⑭ and input to IC1-⑮⑯. IC1 (1) extracts the C. Sync signal, (2) emphasizes the picture, and (3) adjusts the contrast. The extracted C. Sync signal is output from IC1-③. The degree of picture emphasis switched by using DIP switch (S101-⑧) to control the DC voltage input to IC1-⑬. The signal gain is controlled by changing the DC voltage at IC1-⑪ with the contrast control (S-7 board, RV501) on the front panel and the signal is output from IC1-⑩. Then, the gain is adjusted with RV1 and a dither signal is injected into the signal. This dither signal is output from IC301-⑫ and attenuated to the optimum level by RV3. Then the signal has its band limited by a low pass filter and is input to the clamp circuit. The clamp level at that time is adjusted by RV2 and RV502 (brightness control on the front panel), input to the analog-digital converter (IC3-⑫), and converted into 6-bit digital data. The sampling clock for the analog-digital converter is the 13.875MHz clock output from IC301-⑪.

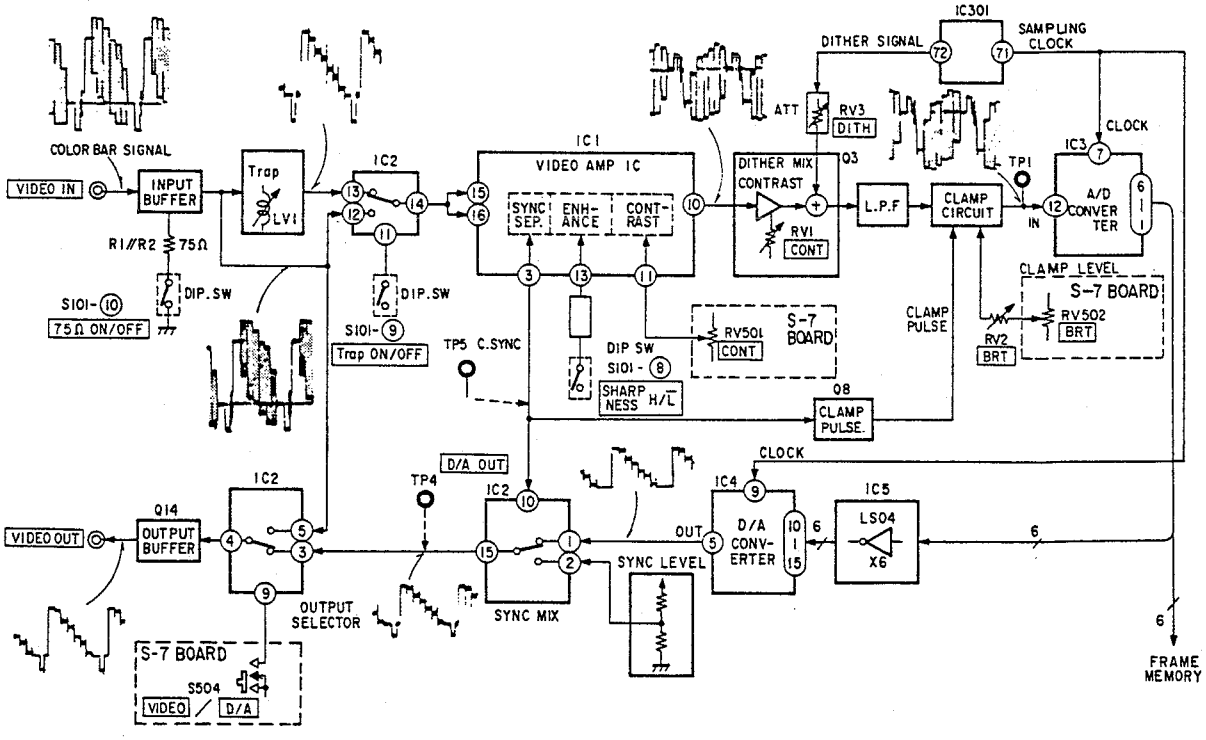


Fig. 7-1. Video Signal Processing Section Block Diagram

The converted digital data is sent to the frame memory and to the inverter (IC5), where its polarity is reversed. Then it is input to the digital-analog converter (IC4), converted back into an analog signal, then output from IC4-⑤. Since this signal lacks synchronization, it is mixed with the C. Sync signal by an analog switch (IC2), output from IC2-⑮, and input into the analog switch (IC2-③) for the output selector. The original signal from the input buffer is input to the other input of this analog switch (IC2-⑤). The front panel monitor output selector switch selects one or the other of these signals and it is output from the output buffer to the BNC connector via CN2-③.

7-2. SYNCHRONIZATION SIGNAL PROCESSING BLOCK

The Synchronization signal processing block has the following four purposes.

1. Separating the horizontal sync and vertical sync signals from the composite sync signal
2. Detecting the 1st field and the 2nd field
3. Adjusting $\overline{VD}$
4. Oscillation of the 13.875MHz clock

7-2-1. Synchronization signal processing circuit

1. The C.SYNC signal extracted from the input signal by IC1 is inverted by IC106 to become the $\overline{\text{C.SYNC}}$ signal (at IC106 ⑪, Ⓐ in Fig. 7-2) After the equalization pulse is extracted by IC102, the $\overline{\text{C.SYNC}}$ signal is input to IC102, where the H.H.pulse is made (IC102 ⑬, Ⓒ in Fig. 7-2) The period for this H.H.pulse is about 1/2H.)
2. The $\overline{\text{C.SYNC}}$ signal is also input to IC103, where the Q.H.pulse is made (Ⓓ in Fig. 7-2). (This Q.H.pulse is low for about 1/4H from the falling edge of $\overline{\text{C.SYNC}}$.) When IC104 latches $\overline{\text{C.SYNC}}$ at the rising edge of the Q.H.pulse, V is output from IC104 ⑧ (Ⓔ in Fig. 7-2).
3. At the rising edge of V, the H.H. pulse is latched, the field is detected (Ⓕ in Fig. 7-2), and the rising edge is output from IC106 ⑥ (Ⓗ in Fig. 7-2). IC105 is toggled by V, but since the reset pulse is input to Pin ⑩ for each frame, 1st FI./$\overline{\text{2nd FI.}}$ is output from Pin ⑨ as shown by Ⓘ in Fig. 7-2.
4. $\overline{\text{V}}$ output from IC104 ⑨ is made into $\overline{\text{VD}}$ in IC103 and output from Pin ⑫. $\overline{\text{VD}}$ is adjusted by RV101 so that its low period is 6H. (If this adjustment is not made correctly, the 1st FI. and 2nd FI. fields are reversed in the print results.)

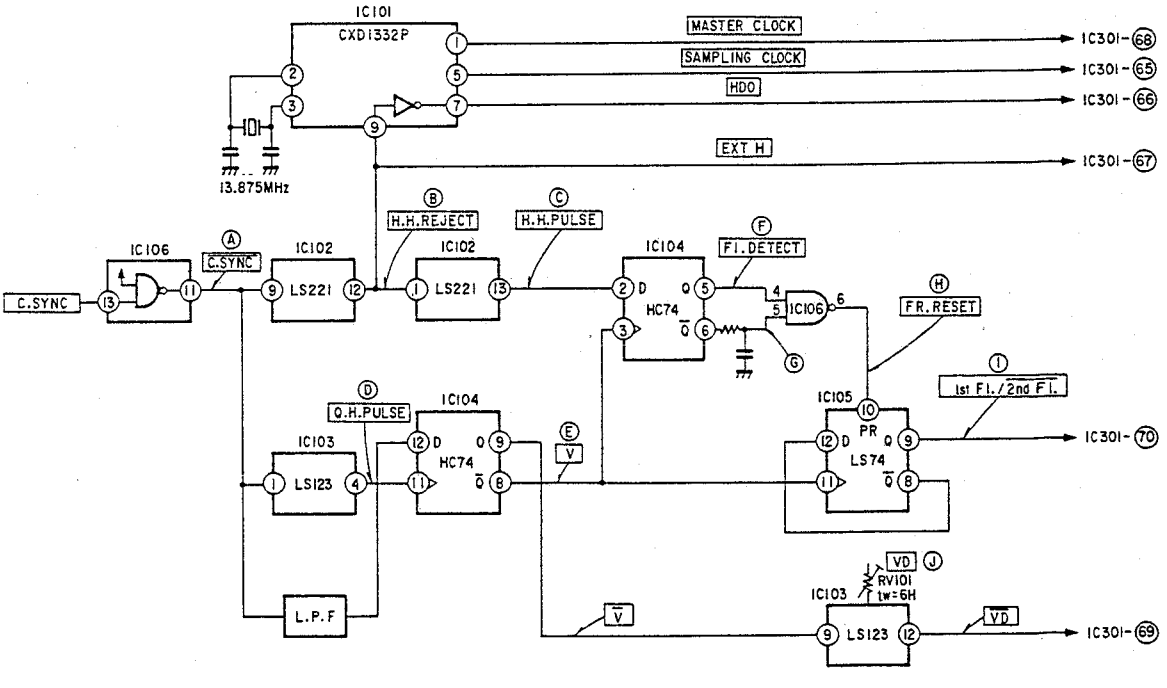


Fig. 7-2. Synchronization Signal Processing Circuit Peripheral Block Diagram

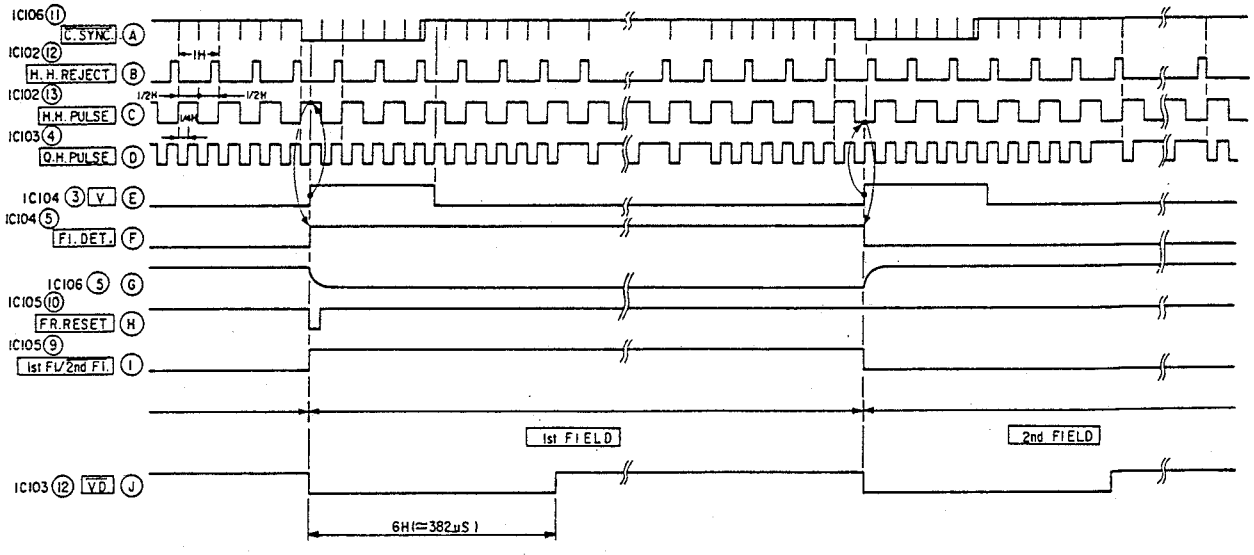
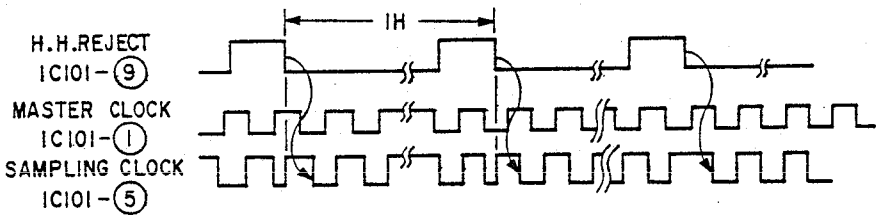


Fig. 7-3. Synchronization Signal Processing Timing Chart

7-2-2. Oscillation circuit

An external crystal oscillator is connected to IC101, so the master clock is output from Pin ① and the sampling clock is output from Pin ⑤. Both these clocks are 13.875 MHz, but the phase of the sampling clock is matched to the falling edge of the H.H. Reject signal input to Pin ⑨. (See the figure below.)



7-3. GATE ARRAY PERIPHERAL CIRCUITS

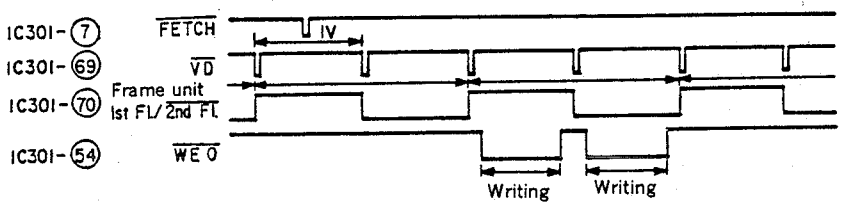
Gate array IC301 comprises the following blocks:

(1) Registers for storing serial data from the CPU (for mode setting)
(2) Frame memory write/read control
(3) Field selector control
(4) 1-line memory write/read control
(5) 1-line print timing generation
(6) Thermal head control
(7) Dither signal generation

The operation of each block is determined by the serial data from the CPU and the mode switch terminals.

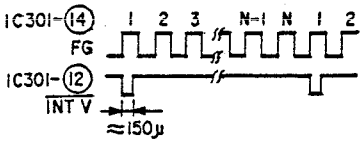
7-3-1. Operations

1. Mode setting
   When the CPU has judged the states for DIP switch (S101), it sends 40 bits of serial data to the shift register in the gate array. This data sets the modes for all the blocks in the gate array.
2. Writing to the frame memory
   When the $\overline{\text{FETCH}}$ pulse from the CPU is input to IC301-⑦, the data for the next frame is written into the frame memory. IC301-⑭ $\overline{\text{WE0}}$ changes this way:



3. Print timing generation

$\overline{\text{INTV}}$, the timing for printing one line is made by counting down the FG pulses for the DC servo motor. The count down number, N, is determined by the serial data from the CPU. Changing this value changes the print period and, since the motor speed is fixed, changes the print line pitch. In addition to the print timing, $\overline{\text{INTV}}$ is used by the CPU to detect the CPU motor speed. The CPU judges the motor speed from $\overline{\text{INTV}}$ and stops the motor if it detects any abnormality.

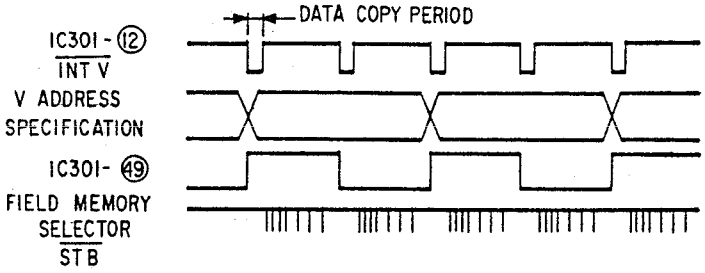


Count down number, N

Signal \ Aspect	3 : 4	1 : 1
NTSC	18	24
PAL	15	20

4. Copying from frame memory => 1-line memory

When the $\overline{\text{COPY}}$ pulse is input to IC301-⑧ from the CPU, the gate array sets $\overline{\text{COPYING}}$ (IC301-⑪) "L" and enters printing mode.
In order to print it, the 1-line of data selected from the frame memory, must be copied to S-RAM IC305. The frame memory comprises 2 fields, the 1st field and the 2nd field. When the gate array specifies the V direction address for the frame memory, the data with the same V direction address is output from each field memory. Since the V direction address changes after every two lines of printing, in frame printing mode, 1-line memory is copied with the field memory selector alternating between the two fields. The data is copied during the "L" period of each $\overline{\text{INTV}}$ pulse.



5. Reading out from 1-line memory
   Data is read out from the 1-line memory while $\overline{\text{INTV}}$ is "H". When the $\overline{\text{STB}}$ pulse is input to IC301-⑨ from the microcomputer, the gate array starts to read from the 1-line memory. The read out data is input to the gate array and compared with the gradation counter. The result is converted from serial data to parallel data and sent to the thermal head. It is latched at the thermal head at the next $\overline{\text{STB}}$ pulse. Then, when the CPU issues the DR signal, the thermal head comes on according to the latched data. This read-out operation is repeated 64 times while $\overline{\text{INTV}}$ is high to complete the printing of one line.
6. End of printing
   The CPU specifies the print start V address and the print end V address with serial data. The V address is incremented or decremented in DIRECT mode. When the gate array completes the specified range of printing, it returns $\overline{\text{COPYING}}$ to "H" to tell the CPU that printing of one screen is complete.

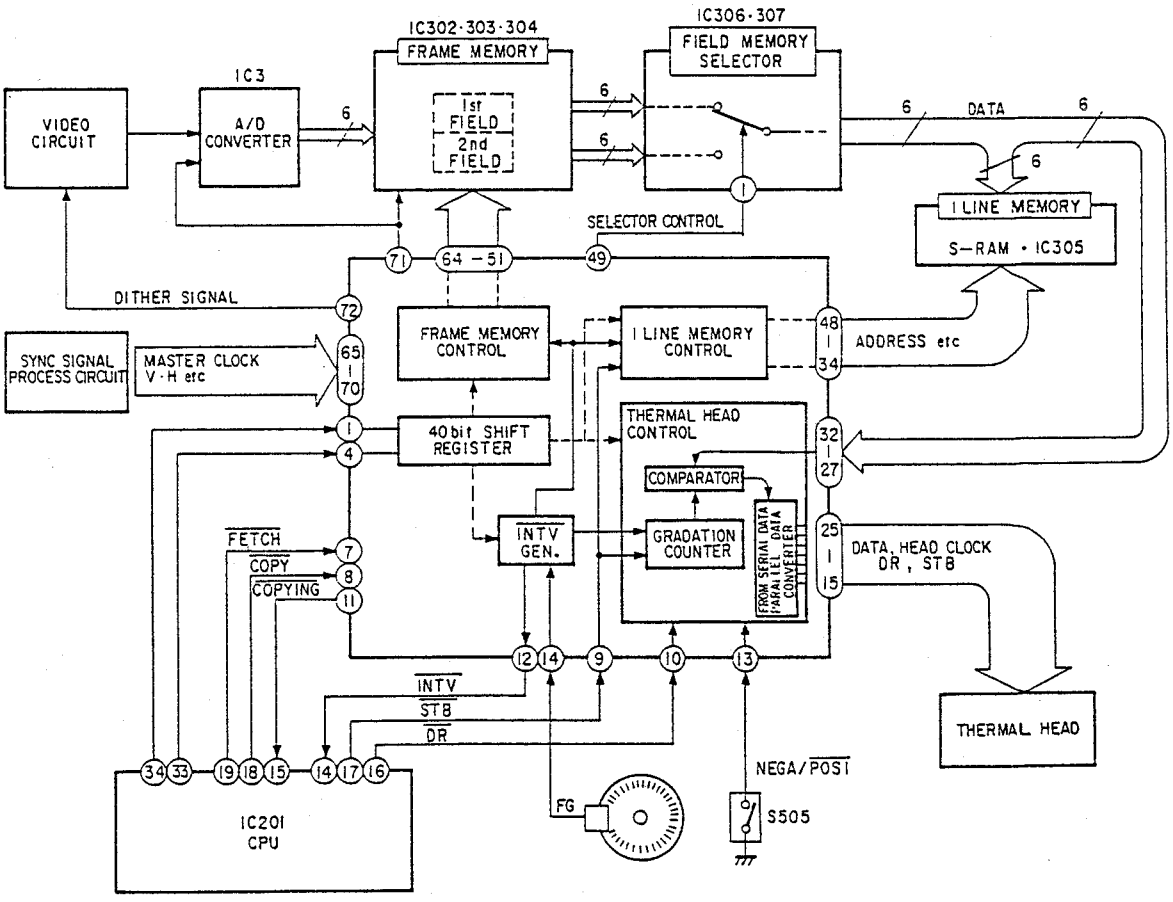


Fig. 7-4. Gate Array IC301 Peripheral Block Diagram

7-4. SYSTEM CONTROL SECTION

Print preparations

(i) Switch on the power and double check that the POWER LED lights up.

(ii) Set the paper in place, switch on the head, and double check that the READY LED lights up.

(iii) Double check that the Video signal (EIA or CCIR) is input to the VIDEO INPUT terminal.

*Note 1: When the paper is set in place, IC201 Pin ㊻ goes "L". When the head is on, IC201 Pin ㊺ goes "L". When both these conditions are met, IC201 switches on the signal to the READY LED (IC201 Pin ③).

*Note 2: Pin ㉜ of IC201 is the reset pin. When the power is first switched on, this pin is held low for a few msec, then set high to end the reset.

7-4-1. Memory write (FETCH) signals from the print key

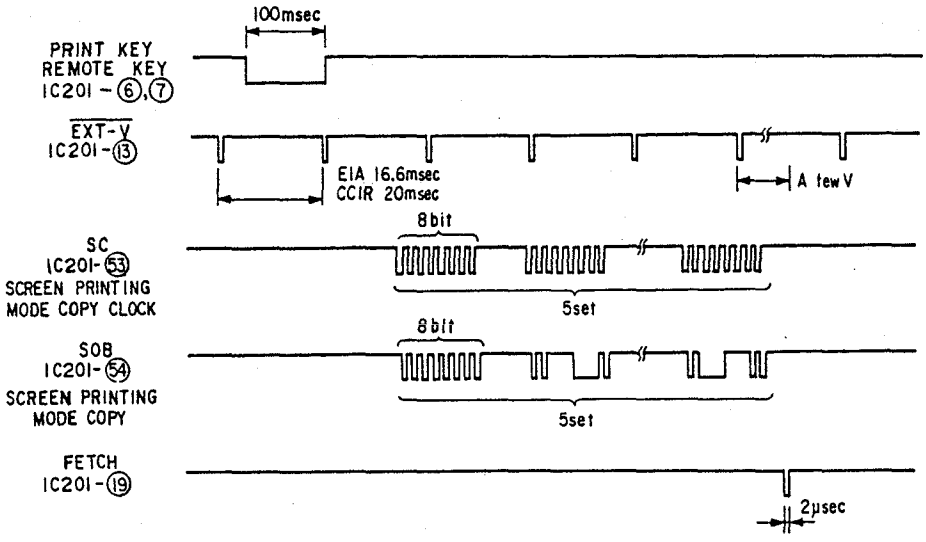


Fig. 7-5.

Operation

(i) When the PRINT key or REMOTE key signal is "L" for about 100 msec, the system goes into PRINT mode.

(ii) When the system goes into PRINT mode, first it verifies $\overline{\text{EXT-V}}$, then it judges whether the format is EIA or CCIR.

(iii) Once the video format has been judged, the screen print mode data for that format is transferred to IC301 Pin ①, the SI (serial input) terminal, from the SOB terminal (serial output B terminal) synchronized with the serial clock. This data is five sets of 8 bits each for a total of 40 bits.

(iv) A few EXT-V pulses after the data transfer is complete, the memory write timing signal (FETCH) is output. The timing is taken from IC301 and the video signal is recorded into the video memory, IC302—304.

7-4-2. From memory writing till screen printing

[1] From after memory writing till the temperature pulse measurement

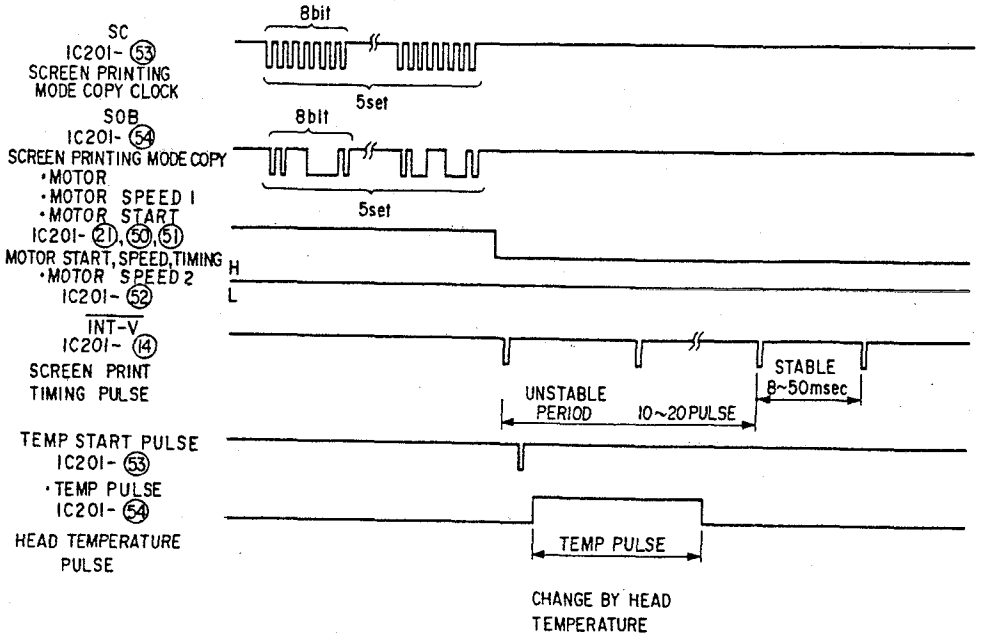


Fig. 7-6.

Operation

The data input to the video memory (IC302—304) with the print key operation is printed with the following procedure.

* Note 1 : The copy key operation is triggered if the copy key goes low for at least 100 msec before this operation.
* Note 2 : This operation only occurs if a video signal is input to the video memory.

(i) In order to specify the output format for the data from video memory, it is synchronized with the signal at the SC terminal and the data is copied from the SOB terminal to IC301 Pin ① (the SI terminal).

(ii) When the data transfer is complete, the motor is rotated, $\overline{\text{INT-V}}$ is generated from IC301 Pin ⑫, and input to IC201 Pin ⑭. Here are the operations of the MOTOR (IC201 Pin ⑤①), MOTOR SPEED 1 (Pin ⑤⓪), MOTOR SPEED 2 (Pin ⑤②), and MOTOR START (Pin ②①) signals.

MOTOR --- Switches the motor $\overline{\text{ON}}$/OFF.

MOTOR SPEED 1, 2 ---Switches the motor speed H/L, between 2—4 speeds.

MOTOR START ---Trigger for inputting the setting data into IC301's internal FG counter.

Here are the terminal states for each mode.

	Motor	Motor Speed 1	Motor Speed 2
STOP	H	H	H
3 : 4	L	L	H
1 : 1	L	H	L
Fast forward	L	H	L

* Note : Since $\overline{\text{INT-V}}$ is made by counting down the FG pulses for the motor servo, if the motor is not turning, it is not output.

(iii) When the motor is turning and the FG pulses are input to IC301 Pin ⑭, $\overline{\text{INT-V}}$ is output from IC301 Pin ⑫, and input to IC201 Pin ⑭. Within IC201, $\overline{\text{INT-V}}$ is measured for about 10—20 pulses to ensure that $\overline{\text{INT-V}}$ has a fixed pulse width. After verifying that the pulse period is 8—50 msec, the system moves to the next screen operation.

(iv) In order to measure the head temperature during (iii), the Temp-Start pulse is output, the Temp pulse is input, and IC201 measures how long the Temp pulse is high.

[II] From temperature pulse measurement to screen printing

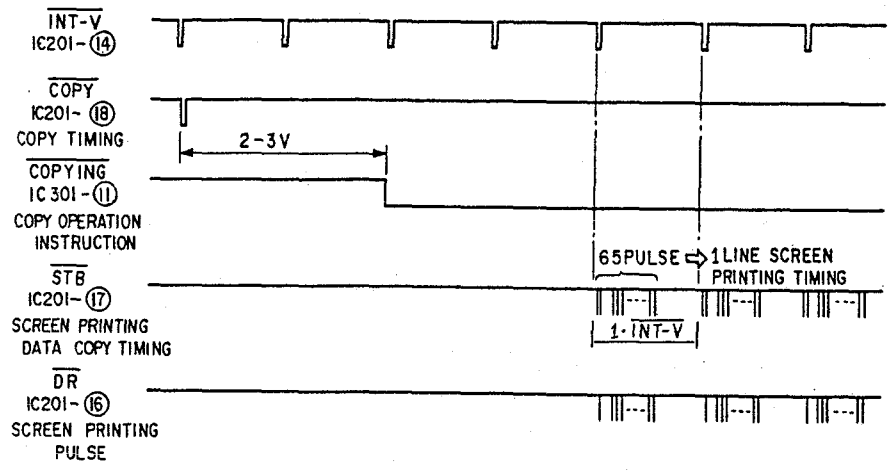


Fig. 7-7.

Operations

(i) When the motor rotation has stabilized (when the $\overline{\text{INT-V}}$ period is stable), the $\overline{\text{COPY}}$ pulse is output to IC301 Pin ⑧ synchronized with $\overline{\text{INT-V}}$.

(ii) When the $\overline{\text{COPY}}$ pulse is input to IC301 Pin ⑧, IC301 outputs the $\overline{\text{COPYING}}$ pulse from its Pin ⑪ to Pin ⑮ of IC201 to tell it that IC301 is standing by for screen printing.

(iii) When IC201 verifies that $\overline{\text{COPYING}}$ is "L", it outputs $\overline{\text{STB}}$ and $\overline{\text{DR}}$. The screen printing timing is set by these signals.

* Note : If the period of $\overline{\text{INT-V}}$ fluctuates too greatly during screen printing, printing is stopped.

[III] To the end of screen printing and stopping

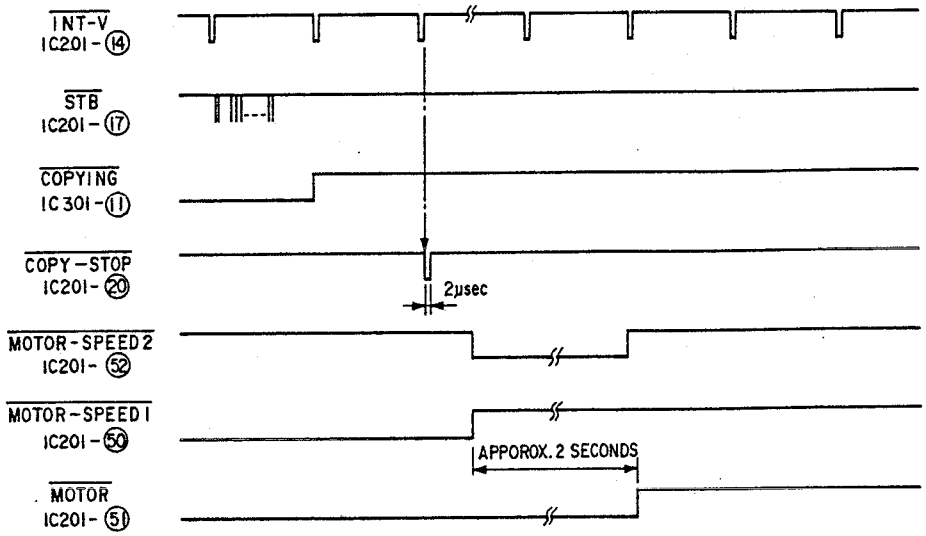


Fig. 7-8.

Operations

(i) IC301 counts the printing lines and when the specified number of lines have been printed, it outputs a "H" signal from its Pin ⑪ to Pin ⑮ of IC201, which tells IC201 that the printing operation has ended and it outputs the $\overline{\text{COPY-STOP}}$ pulse.

* Note: The $\overline{\text{COPY-STOP}}$ pulse is also output even if $\overline{\text{COPYING}}$ is "L", if IC201 judges that something abnormal has arisen. In such a case, when this $\overline{\text{COPY-STOP}}$ pulse is input to IC301, it sets $\overline{\text{COPYING}}$ "H".

This characteristic can be used to analyze any problem that causes printing to stop. If $\overline{\text{COPY-STOP}}$ was issued while $\overline{\text{COPYING}}$ was still "L", the cause is related to IC201, but if $\overline{\text{COPY-STOP}}$ was issued after copying went high, then the cause is related to IC301.

(ii) After the $\overline{\text{COPY-STOP}}$ pulse, $\overline{\text{MOTOR SPEED 1,2}}$ are changed to fast forward for about 2 seconds, then Motor is set "H" to stop the motor and complete the entire print operation.

7-4-3. Setting the mode

No 1—7 of DIP switch S101 on the rear panel are input to IC201 to switch the screen printing mode. The mode is set when the PRINT or COPY key is pressed and the data is input serially to Pin ① of IC301 from Pin ㉞ of IC201. The mode is not switched during screen printing.

7-4-4. Motor drive section (IC401)

The motor speed is controlled by IC401 (CX069A). The frequency of the FG (optic read out) of the motor section is detected and fed back to IC401, which controls the motor drive transistor Q403 to control the speed.

The motor is switched ON/OFF and its speed controlled by IC201 Pin ㊿—㊿. (See the explanation of the system control section.)

Since this unit produces the $\overline{\text{INT-V}}$ signal that provides the screen printing timing by frequency dividing the FG frequency, even if there is some slight fluctuation in the FG frequency, the paper feed distance and printing quality are held constant.

7-5. THERMAL HEAD (TH67604) SECTION

The thermal head (TH67604) of this unit comprise 1-line of 768 dots (32 bits×24) and prints out the screen vertically.

7-5-1. Configuration

There are six sets of the assemblies shown below. (The DATA inputs are DATA 1—6. The other terminals are common.)

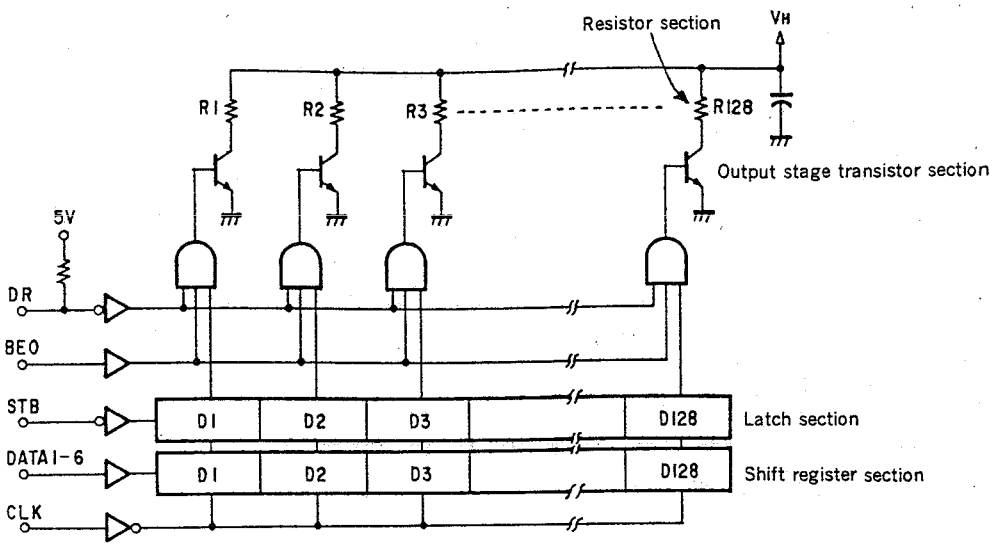


Fig. 7-9. Head Internal Circuit Configuration

7-5-2. Timing Chart

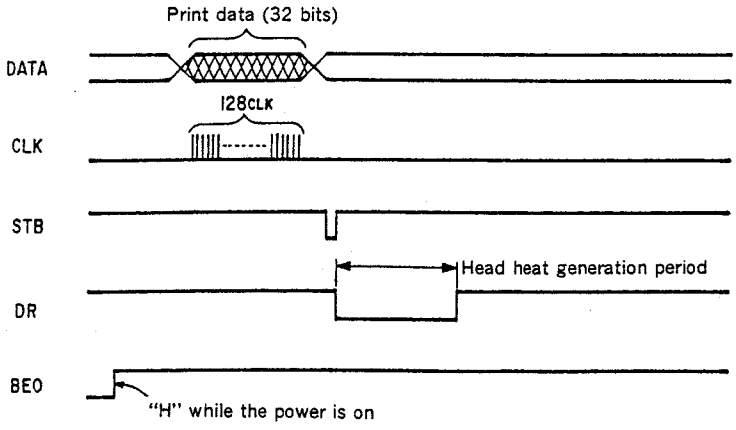


Fig. 7-10. Timing Chart

7-5-3. Basic operations

All the signals are input to the head from IC301. This section only explains the operations for one block. (The operations for the other blocks are the same.)

(i) The 128 datas of screen printing are input to the shift register synchronized with CLK.

(ii) When the STB pulse is input, the data input in (1) is moved from the shift register section to the latch section.

(iii) When the DR pulse is input, the output stage transistors are switch ON/OFF by the "H" and "L" pulse section data. While the transistors are on, the resistors heat up and thermosensitive paper changes color. The amount of heat generated is controlled by varying the length of the DR pulses, so the color darkness of the printing on thermosensitive paper can be varied.

* Note : The BEO terminal goes from "L" to "H" when the power is switched on. After that it stays "H".

7-5-4. Stair generation

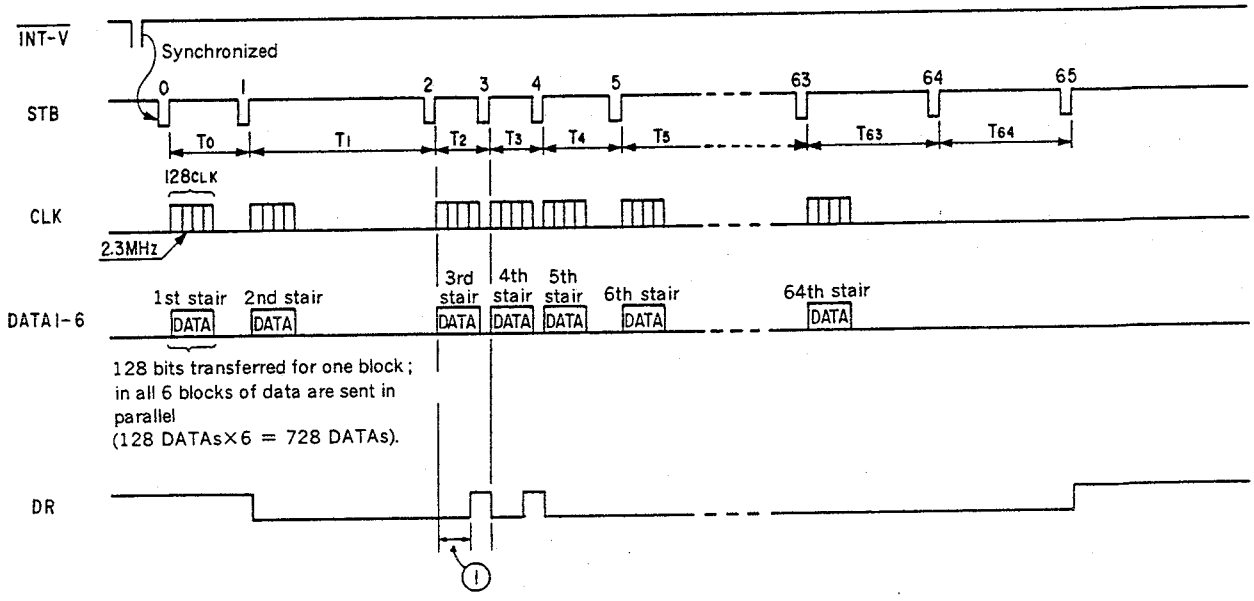


Fig. 7-11. Stair Generation

As explained in the last section on basic operation, the darkness of the printing can be controlled with the DR pulses, but it is also possible to change the darkness by changing the high and low data input to the latch section. This section explains this method. See Fig. 7-11.

(i) The data recorded in the video memory, IC302—304, in the print operation is input to IC305 by IC301 1H (1-line) at a time and output to the IC301 stair data generation circuit. [The stair data generation circuit outputs the 6 bits of data recorded in IC305 as one of 64 levels. If the 6-bit data is 3, then data is sent to the head during the 1st, 2nd, and 3rd stairs of DATA 1—6 in the figure, but from the 4th stair on, the data is not sent. In this way, the screen is printed with the third stair, but from the fourth stair on is not printed. (See the explanation of the basic operations in 7-5-3.)]

(ii) The data is input to IC301, when the "0" STB pulse synchronized with INT-V is input, the first stair data is sent to the head shift register section.

(iii) When the "1" STB pulse is input, the 1st stair data is transferred to the latch section and the 2nd stair data is input to the shift register section. At the same time, the DR pulse goes "L" and the "H" data among the data input as the first stair data switches on the corresponding output stage transistors, heating up the corresponding resistors. The "L" data switches OFF the corresponding output stage transistors, so those resistors do not heat up.
This operation is carried out 64 times. If "H" data is sent the 1st through 64th times, the resistors generate heat the entire time and the printing is the blackest possible. If the data is only high until the 32nd time, the printing is an intermediate stair. This is how intermediate stairs are generated by sending high data a certain number of times and generating heat in the resistors that many times.

(iv) Thus, by controlling the time until the next data is transferred to the latch, intermediate stairs can be achieved simply. In other words, intermediate stair darkness can be controlled by changing the STB intervals, T_0, T_1, T_2, T_3, T_4, ..., T_{64}.
Specifically, IC201 matches the intervals T_1—T_{64} to the paper's γ characteristic (the degree of darkening relative to the heat applied). This is called γ characteristic control.

(v) If the DR pulse is also controlled as described in 7-5-3, (Fig. 7-11 ①), even fine stair can be expressed.
* Note : The section in ① is generated when the STB pulse T interval is 70 μsec. (The minimum time for the STB pulses is 70 μsec.)
Thus, this unit provides smooth expression of intermediate stairs by controlling the STB pulse T interval and the DR pulses.

7-5-5. Temperature compensation

As explained in 7-5-4, intermediate stairs are expressed by controlling the STB pulse T interval and the DR pulses, but since the energy required to make thermosensitive paper turn color varies with the ambient temperature and with the heat generated by and built up in the printing head during continuous printing.

This unit has a built-in thermistor (CN301 Pins ① and ②). IC201 measures the change in the head temperature and to compensate for temperature change controls the STB pulse T interval and the DR pulse, just as is done for stair generation. Specifically, when the temperature rises it reduces the STB pulse T interval and the DR pulses, but when the temperature falls, it increases the STB pulse T interval and the DR pulses.

Reference

Temperature measurement circuit

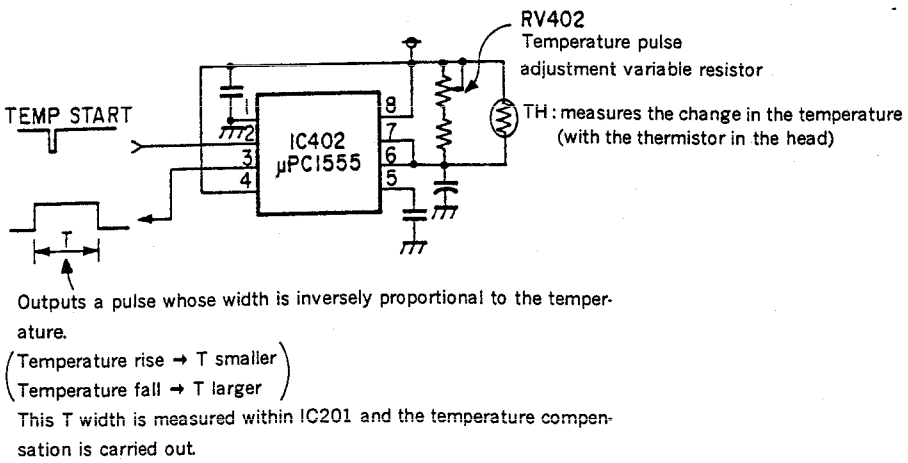


Fig. 7-12. Temperature Pulse Generation Circuit